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UNIFIED FACILITIES CRITERIA (UFC)

DESIGN: BOWLING CENTERS

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UNIFIED FACILITIES CRITERIA (UFC)

CRITERIA FORMAT STANDARD

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U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

HQ AIR FORCE SERVICES AGENCY (Preparing Activity)

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	**Date**	**Location**

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This UFC supersedes "Bowling Centers Design Guide" ca. 1980.
The format of this document does not conform to UFC 1-300-01; however, it will be reformatted at the next revision.

FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate.

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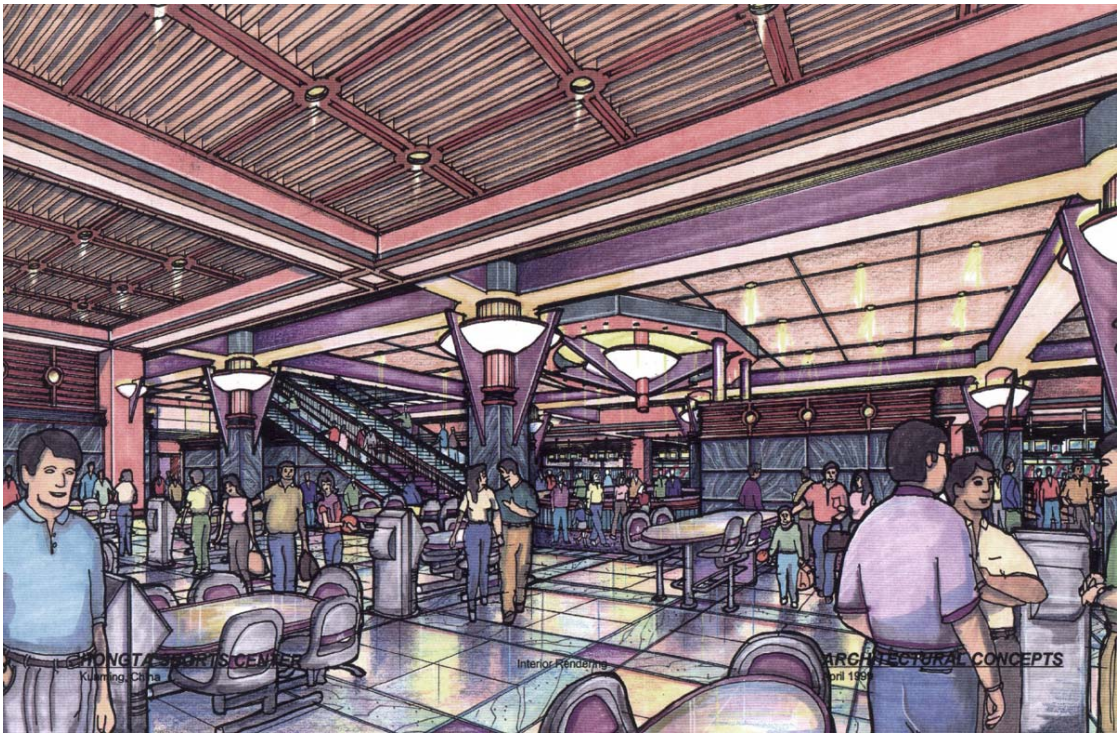


1-1 Purpose and Organization

This Design Guide provides criteria to evaluate, plan, program and design Bowling Centers for the purpose of enhancing the quality of life for the Air Force community. This document is intended for use by Base Civil Engineer personnel, Base Bowling Center managers, Major Command and Headquarters facilities programming, design and construction personnel, design agents, Needs Assessment Study teams, and design architects and engineers. It is intended to help all participants better understand Bowling Center requirements so that they can effectively participate in the project development process.

This Guide is applicable to all design projects for new or renovated Bowling Centers on Air Force installations, both in the continental United States and overseas. It provides criteria for determining program requirements, site evaluation and planning, overall facility design, and design of indoor and outdoor spaces. It is to be used in conjunction with other Air Force, Department of Defense and industry documents. A list of resources is presented in the appendices.

1-1.1 Overview

The Information in this Design Guide is organized to address the key elements in the planning and design process:

- Chapter 2: Site Design – Considerations of location, organization and access, and force protection;

- Chapter 3: Building Design – Guidance on organization and character;
- Chapter 4: Functional Area Criteria – Design criteria for each of the functional areas within the Center, including their relationships;
- Chapter 5: Example Plans and Space Allocation – Illustrative plans and sample space allocation lists for 12, 24 and 32 lane Centers;
- Chapter 6: Specialized Requirements – Technical guidance on materials, equipment, and building systems;
- Appendix A: Resources and Links.

1-2 Functional Activities – a New Model

This Design Guide sets out a new model for Air Force Bowling Centers that takes its direction from advances in the commercial sector. Key to this new model is the expansion of entertainment options available to the Center's users. Sometimes termed a "Family Entertainment Center," the new Bowling Center features a mix of activities that respond to the interests of the market, and that, in turn, generate improved operating revenues. Typically, the featured activities include a wide range of computerized games, expanded dining facilities, and bowling in both conventional and special ("glow bowling") formats. Other options might include outdoor games, a lounge and bar, billiards and other lounge games, or restaurant dining. Together this collection of activities represents the range of choices open to the planners of Bowling Centers.

Development of the facility space program from these choices should reflect the mix of bowling, games and dining activities that will create an entertainment center enjoyable by military personnel, their dependents and authorized civilians. Consideration should be given to the current and projected user population to be served by the proposed Bowling Center, as well as specific population categories with potentially varying entertainment needs (such as dependent spouses, children, and retirees). The size and arrangement of activities within the facility as well as the location of the building should support and optimize the operation of the Center's activities.

The array of possible functional activities of the Bowling Center can be grouped as: bowling, games, dining, administration, and building and activity support. Based on their relationship to the goals of the new model, these activity choices for the Center can be described as essential or "core activities," and additional choices or "optional activities". Core activities and spaces should be a component of any Air Force Bowling Center, regardless of size or location. Various optional activities may be appropriate given the unique needs at a particular installation, considering factors such as demographics, market studies, and whether the location is CONUS or OCONUS. Table 1-1 lists these recommended core and optional activity choices.

See Next page for Table 1-1: Space List – Activity Choices

Table 1-1: Space List – Activity Choices

ACTIVITIES	CORE ACTIVITIES	OPTIONAL ACTIVITIES
Bowling	Lanes and Approaches Bowler Seating/Scoring Spectator Seating Concourse Lockers	
Mechanics	Mechanic's Workroom and Toilet Mechanic's Storage and Laundry Lane Maintenance Storage Pinsetting Pin Storage Service Aisle	
Dining	Café Seating Activity Rooms	Outdoor Dining Lounge Restaurant
Food/Beverage	Service Counter Bar Service (at Service Counter) Serving Area Food Preparation Area Food Storage Receiving	Dedicated Bar Dedicated Bar Storage
Games	Amusement Machines	Lounge Games Outdoor Games Area Slot Machines (OCONUS)
Pro Shop	Display (at Reception Counter) Storage Alcove Drill in Mechanic's area	Display/Sales Room Dedicated Storage Dedicated Drill Room
Administration	Reception Counter Reception Storage General Office Manager's Office	
Building Support	General Storage Custodial Toilets Mechanical/Electrical/Communications Circulation	

The design of a Bowling Center should consider the responsiveness of the functional activity choices to the wishes of the base population, as validated by the Needs Assessment Study. The design also needs to optimize their organization in terms of the efficiency and effectiveness of the Center's internal planning and the implications of its location on the installation. The following sections of this Guide discuss these design constraints and opportunities.

Chapter 2 Site Design

2-1 Location

The Bowling Center should be convenient to the users and located near the center of activity on the installation, preferably as part of the community support area. It should be close to other entertainment and recreational facilities, and to public destinations such as shopping. The Center should be readily accessible from the main entrance to the installation.

- Where possible, select a central location for convenient breakfast and mid-day use of the facility, as well as use at nighttime hours.
- Areas of heavy pedestrian and vehicle traffic are desirable locations for Bowling Centers.
- Ideally the site will provide a prominent, visible location. The Center should be easily identifiable from approaching cars, base transportation and pedestrian ways.

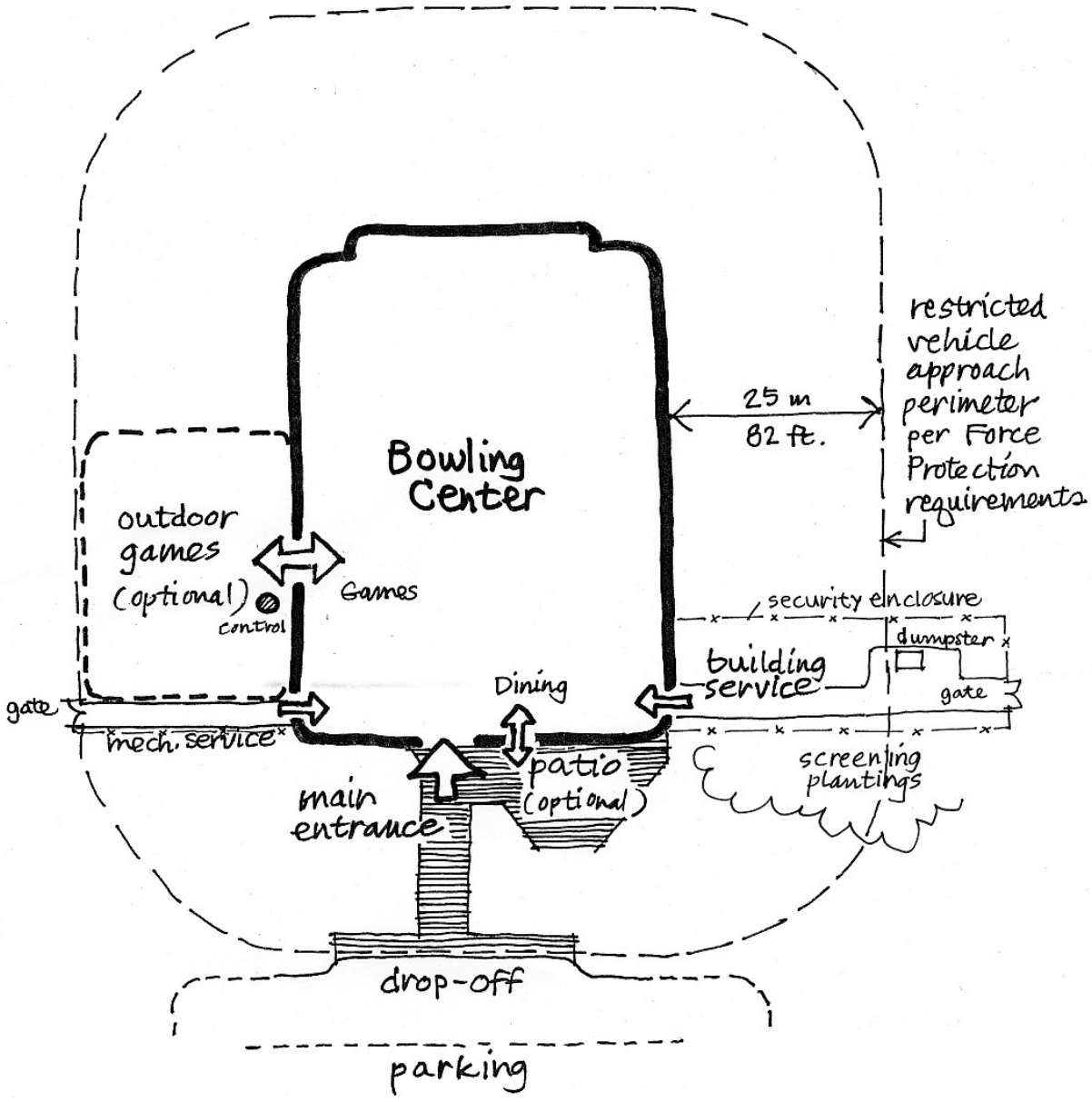
2-2 Size and Organization

Site size depends on gross building area, parking requirements and force protection requirements, as well as outdoor activities, accessways, landscaping and site development requirements. The building floor area and the parking are dependent on the number of lanes and the size of the other activity areas (e.g. the café and games) in the Center.

- Parking requirements will vary with the local conditions at each specific installation, including the prevalence of privately owned vehicles, convenience of the Center to pedestrian access, and proximity to other parking areas. Commercial Bowling Centers typically allow a minimum of four parking spaces per lane.
- Force protection requirements (UFC 4-010-01) must be considered in designing the site. They will substantially increase compared to past standards the amount of site area needed for a facility of a given size. Key in this impact is the requirement that vehicles not approach the facility closer than 25 meters (82 feet), unless the building design is modified to afford the required level of protection. This will establish the closest that drop-offs, parking and roadways may come to the building. In addition, security measures must be provided if service vehicles are allowed to approach the building service entrances. An unobstructed space must be created within 10 meters (33 feet) on all sides of the building. This is not intended to preclude landscaping.

- Provide outdoor activity areas for dining and games, if included. These spaces should be integrated into the site landscaping, and lighted and fenced as appropriate.

Figure 2-1: Site Relationship Diagram



2-3 Amenities and Services

- Situate the building such that the entrance and other architecturally distinctive features are clearly visible from adjacent roadways.
- Provide building and site signage, in accordance with installation standards, to clearly identify the Center.
- Provide marked parking and access for persons with disabilities at the main entrance and any other public entrances. Consider providing a canopy at the main entrance.
- Provide vehicular access to the main entrance drop-off area, the parking, and services entrances. Separate patron access from service access. Note the force protection restrictions cited above.
- Provide landscaping using native planting and materials, and consistent with installation planning guidelines. Coordinate with force protection standards.
- Provide free-standing exterior lighting at the building, outdoor activities, and parking areas for nighttime site use, security, building definition, and identification.
- Proximity of the Center to existing utility systems can reduce development costs. Provide water, sanitary and storm systems, plus natural gas, steam service or fuel oil system as appropriate to the installation.
- Provide electric, telephone and communications, and fire alarm service to the building.

Chapter 3 Building Design

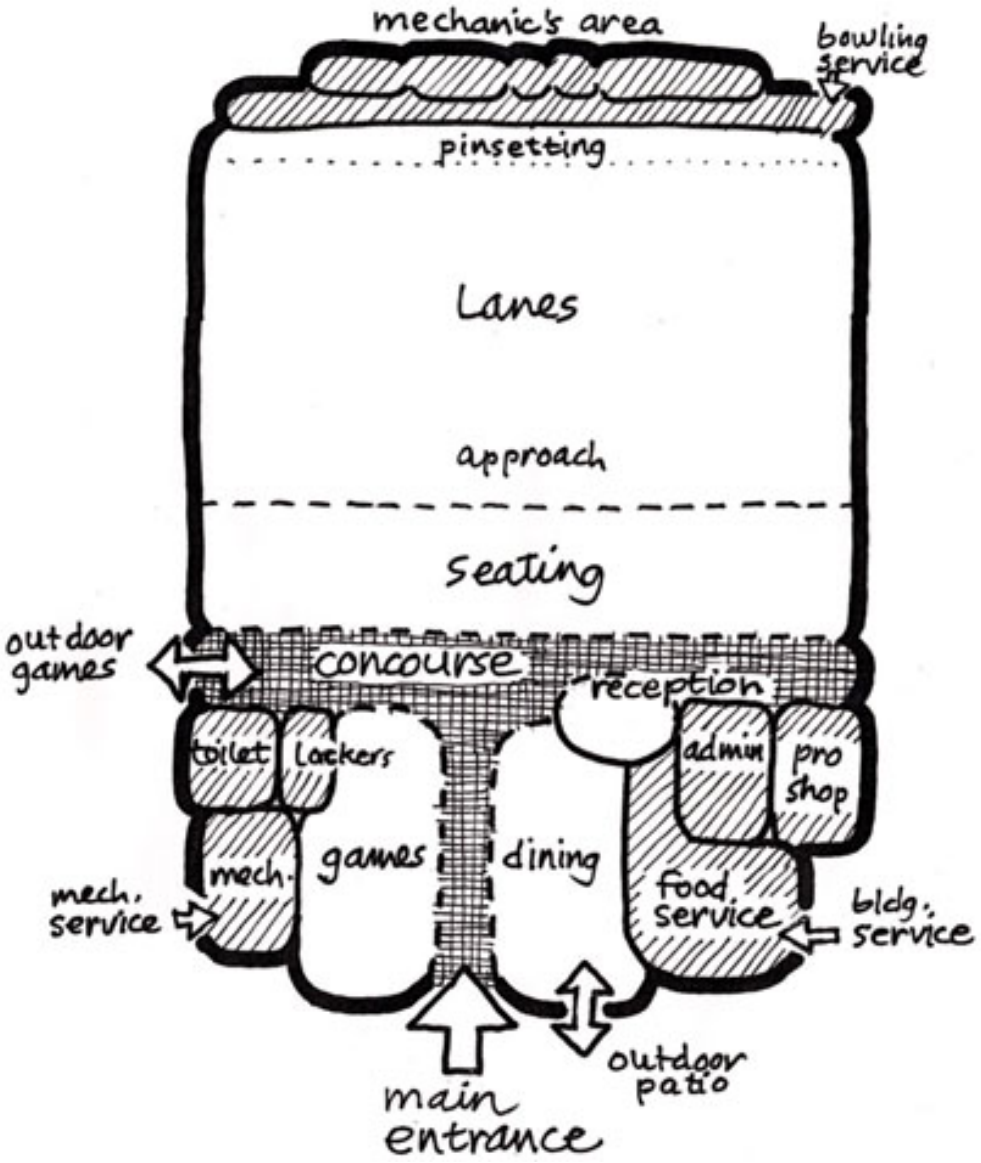
3-1 Organization

The Bowling Center contains three primary public activities: bowling, dining and games. The sense of enjoyment experienced by the patrons, and the successful generation of revenue for the Center, depends on optimizing the attractiveness and effectiveness of these spaces. All should have prominent positions along the concourse and entry gallery and share in visibility to the patrons of the others.

The Center is organized around the public circulation. It links the key areas of the building and provides visibility and easy access to all public areas. The main entrance passageway should connect to the concourse, and give the entering patron a clear sense of orientation. Users entering the facility should move by and view the activities within the Center, with an emphasis on bowling, dining and games. Within the concourse, the reception counter provides a central point of welcome, information and orientation for the patrons, and the administrative center for the operating staff. Its location gives an overview of all of the activity areas of the Center.

Figure 3-1, next page, illustrates the relationship of the major functional spaces within the Center.

Figure 3-1: Facility Space Relationship Diagram



The sequences experienced by users of the Bowling Center typically start at the parking area and the main entrance. Bowling patrons proceed through the centrally located entrance passageway or gallery to the reception desk, viewing the games and dining areas on the way. From the reception counter and the pro shop sales display, they proceed to the seating areas and the lanes.

Dining patrons enter by viewing the games and dining areas, and the bowling beyond. In both cases, exposure to the other activities in addition to the chosen destination should increase customer enjoyment and the overall patronage of the Center.

3-2 Exterior Design

The Bowling Center exterior design needs to communicate the sense of active entertainment that occurs within the building. By necessity, the Center is a large, one-story building with few windows. Thus the challenge to the designer is to utilize the primary interior elements – the main entrance, the concourse and entrance gallery, the café and optional patio, and the games area – to create a dynamic exterior massing with a lively, informal and inviting exterior appearance. Emphasize the building entrance, making it highly visible from the street and the parking area. A canopy covering the entrance can protect the patrons from the weather and give a unique identity to the building, while directing the patrons to the entry. Maximize glazing in the exterior walls, particularly at the entrance, to give views of the attractive interior activities to the entering users and passers-by. For example, large windows are appropriate for the café. When located in the entrance wall, they can enliven the building façade and display the interior activity to the public outside.

The Center should be designed so that the distinctive character or theme of the interior spaces is reflected in the exterior design. The materials of construction should reinforce this character and be of good, durable quality, such as brick masonry, special finish metal panels and accent elements, and glass block and laminated sheet glass glazing. The exterior materials must be consistent on all faces of the building. Consider special building signage and lighting to help communicate the entertainment role of the Center. The exterior design should be consistent with architectural compatibility standards in the Installation Comprehensive Plan.

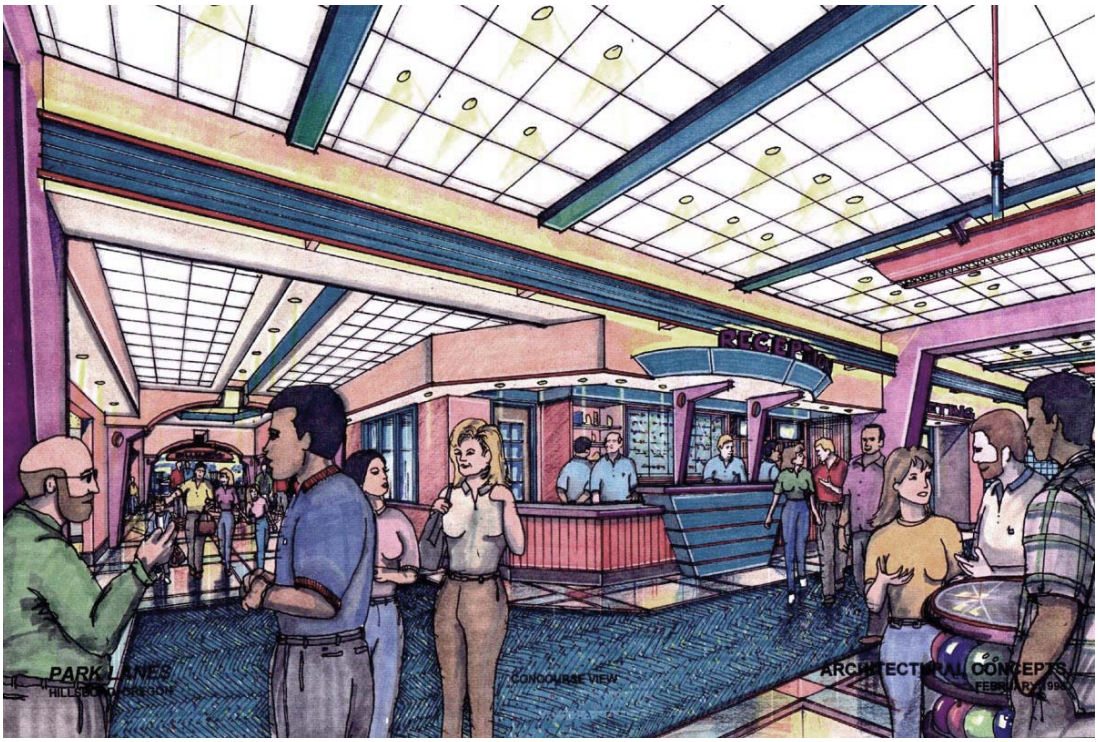
3-3 Interior Character

The visual character of the Bowling Center interior should strongly establish the sense of entertainment and excitement enjoyed by the users. Energy and action should characterize the public spaces. Dramatic lighting and vibrant colors can be used to reinforce these qualities. “Glow bowling” products can create a special environment for bowlers and spectators during later operating hours or on weekend evenings (“Glow bowling” is a specialty sound and lighting package with ultraviolet illumination and “black light” sensitive surfaces). Create an open design for the interior that gives visibility and easy access between the public spaces. Use natural light to help define spaces and provide varied character. Avoid direct daylighting in bowling and games areas. Enliven dining and circulation spaces with windows to the outdoors or skylights.

The spatial character of the concourse should emphasize its central role in the organization of the facility. Generous circulation space, high ceilings, dramatic lighting and openness to surrounding activities are all recommended to communicate this character. Destination activities along the concourse should each be visibly distinctive, while reinforcing the overall character of the public spaces. Ensure design consistency for the strongest expression of character and image. The pins and the masking units above them, as well as the side walls along the lanes are key elements in the visual environment of the Center as experienced by the patrons.

Signage and graphics should be designed as a consistent package throughout to give clear identity to the individual spaces and to enhance the overall visual effect. Equipment should be “state of the art,” and the Center should display the attributes of a first class professional operation.

Chapter 4 Functional Area Criteria



Each activity area within the Bowling Center is listed below. The description of each of these spaces includes the following types of functional information:

- Use description
- Key relationships
- Key dimensions, where applicable
- Room finishes
- Special requirements

4-1 Public

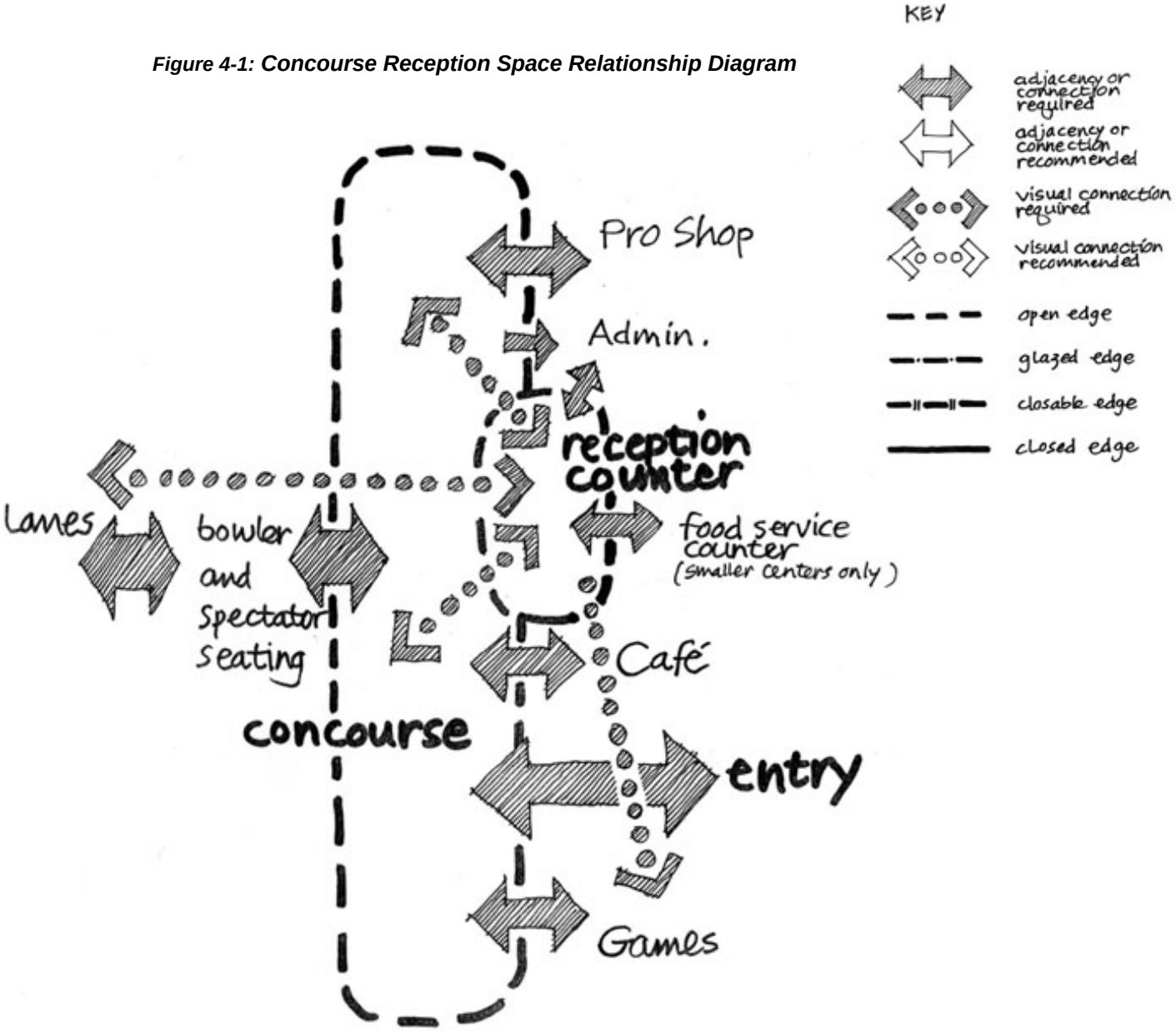
Description/Relationships:

The public areas include the main entrance to the Center, the connecting entrance gallery (public circulation), the concourse (patron walkway), and the toilets and lockers. The public circulation -- the entrance gallery and the concourse -- is the hub of the Center. The design of these areas is key to establishing their visual and organizational importance, and to setting the character of the Center. Their design must give the sense of energy and excitement that is essential to the Center as a whole. The entrance circulation should be specifically designed to orient the patrons to the dining and games areas by bringing them past these featured activities on their way to the bowling area. The concourse provides the circulation link between the entrance gallery, the reception counter, bowling and the other activity areas, all of which should be clearly visible. The concourse is also a party area for special functions.

Lockers are provided for the convenience of patrons who bring their own bowling equipment. The demand for this service may vary with the specific installation. Lockers may be recessed along the concourse, but should not be placed where they will block views into featured activity areas. They are preferably not in a dedicated locker room, but may be placed along otherwise required circulation, such as at toilet rooms. Coin-operated lockers may also be provided in the games area for the convenience of those patrons.

Public toilets should be accessed from the concourse and should be convenient to all activity areas, and dining in particular. In large Centers, distribution of the required fixtures between two toilet room locations is recommended.

Figure 4-1: Concourse Reception Space Relationship Diagram



4-1.1 Main Entrance and Entrance Gallery

Size/Dimensions:

- Provide generous width at the entrance circulation elements to permit comfortable circulation of groups and easy viewing of adjacent activities and displays. A minimum of 10 feet (3100 mm) is recommended for the entrance passageway. Provide a vestibule at the building entrance for weather protection. The vestibule must be at least 8 feet deep.

Finishes/Special Requirements:

- Provide an exterior canopy at the main entrance to shelter the entering patrons and to give architectural identity and emphasis. This should be the most visible and important element of the exterior.
- Provide doors with substantial glass area to ensure that the interior will be visible to approaching patrons. Sliding doors are recommended but swinging doors are also acceptable (consider power operation). Review the security issues of key management.
- Provide a uniform floor level with the exterior walkway, and with all other activity areas of the Center.
- Featured activity areas should be visible from the entrance gallery.
- Provide durable, attractive wall finishes, such as brick, wood, or painted or vinyl-covered high-impact gypsum wall board (not pre-finished wall panels).
- Consider special ceiling design for spaciousness and dramatic interest.
- Provide indirect fluorescent lighting. Use colored gel sleeves for special effects, and recessed halogen spotlights for special emphasis.
- Extend provisions for “glow package” lighting and sound system into the entry to increase the dynamic sense of this area.
- Hard surface flooring is recommended at the main entrance.
- Static-control carpeting or hard surface flooring is recommended in the entrance gallery and other portions of the public circulation.

4-1.2 Concourse

Size/Dimensions:

- The circulation along the concourse should be free of obstructions and clutter.
- Allow a minimum width of 10 feet (about 3000 mm) for the concourse (“patron walkway”), continuous along the full length of the bowler and spectator seating area. A greater width (about 15 feet or 4570 mm) is recommended at the reception counter to allow for patrons gathering here. Increased width may also be desirable to provide circulation space at display cases and information kiosks, vending machines, ball cleaners, etc.

Finishes/Special Requirements:

- Provide a uniform floor level with the spectator and bowler seating, and with all other activity areas of the Center.
- All activity areas should be visible from this space.
- Use high ceilings for spaciousness and dramatic interest.
- Consider skylights for ambient light and to reinforce the central organizing character of this space. Protect bowlers' areas from direct sunlight and distracting glare. Consider artificially illuminated "skylight" ceilings.
- Provide durable, attractive wall finishes, such as brick, wood, or painted or vinyl-covered high-impact gypsum wall board (not pre-finished wall panels).
- Static-control carpeting is the recommended choice for flooring.
- Provide indirect fluorescent lighting. Use colored gel sleeves for special effects, and recessed halogen spotlights for special emphasis.
- Include provisions for "glow package" lighting and sound system.
- Provide locations for display cases, kiosks, and information boxes.
- Vending machines and lockers that occur along the concourse should be in alcoves or recessed. Do not locate these near the reception counter.
- Provide furnishings or built-ins for coat and bag storage.
- Provide corner guards at all exposed corners or edges.
- See Chapter 6 for other specialized requirements.

4-1.3 Patron Toilets

Size/Dimensions:

- Provide separate plumbing fixtures for men and women in quantities as required by the applicable plumbing code, including provisions for persons with disabilities. See Chapter 5 for requirements and Chapter 6 for referenced standards.
- Provide adequate space at entrances and fixtures for maneuvering by persons with disabilities as established by referenced accessibility standards.

Finishes/Special Requirements:

- Use ceramic tile for the wall finish from floor to ceiling or up to 7 feet above the finished floor.
- Use non-slip ceramic tile for flooring.
- Use wall-washing fluorescent fixtures above the plumbing fixtures. Maintain lighting levels as established by code.
- Provide GFI-equipped electrical outlets.
- Sinks should be in a vanity counter with mirrors above the sinks.

- Provide towel dispensers and waste receptacles. Hand dryers are recommended as well as paper towel dispensers for sanitary aspects and ease of maintenance.
- Entrances without doors (“airport style”) are recommended.
- See Chapter 6 for other specialized requirements.

4-1.4 Lockers

Size/Dimensions:

- As a general guide, provide 10 lockers per lane.
- Lockers are typically manufactured in vertical stacks of 5 lockers, 72 inches tall, 16 inches wide and 24 inches deep. Single- and double-width stacks are available.

Finishes/Special Requirements:

- Provide carpet flooring and wall finishes to be consistent with adjacent areas.
- If not on the concourse, match adjacent lighting or provide recessed fluorescent lighting.
- If possible, provide soffits over locker units to prevent clutter from collecting on tops.

4-2 Bowling

Description/Relationships:

This area includes the lanes and approaches, bowler seating and spectator seating. Because of its size and activity level, it is a major visual focus of the Center. The concourse is directly adjacent, and provides the circulation link between bowling and the other activity areas, which should be easily visible from the seating area. Provide a single level floor throughout this area to maximize flexibility and universal accessibility. The design character of this area is key to establishing the sense of energy and excitement that is essential to the Center as a whole.

A standard component of new model Centers is the equipment necessary to create a “glow bowling” format for the bowling activity. This term refers to a special effects ultraviolet lighting and sound system that radically changes the interior environment of the Center to give the patron a different and exciting experience. Several proprietary systems are available from bowling equipment suppliers or Air Force approved vendors.

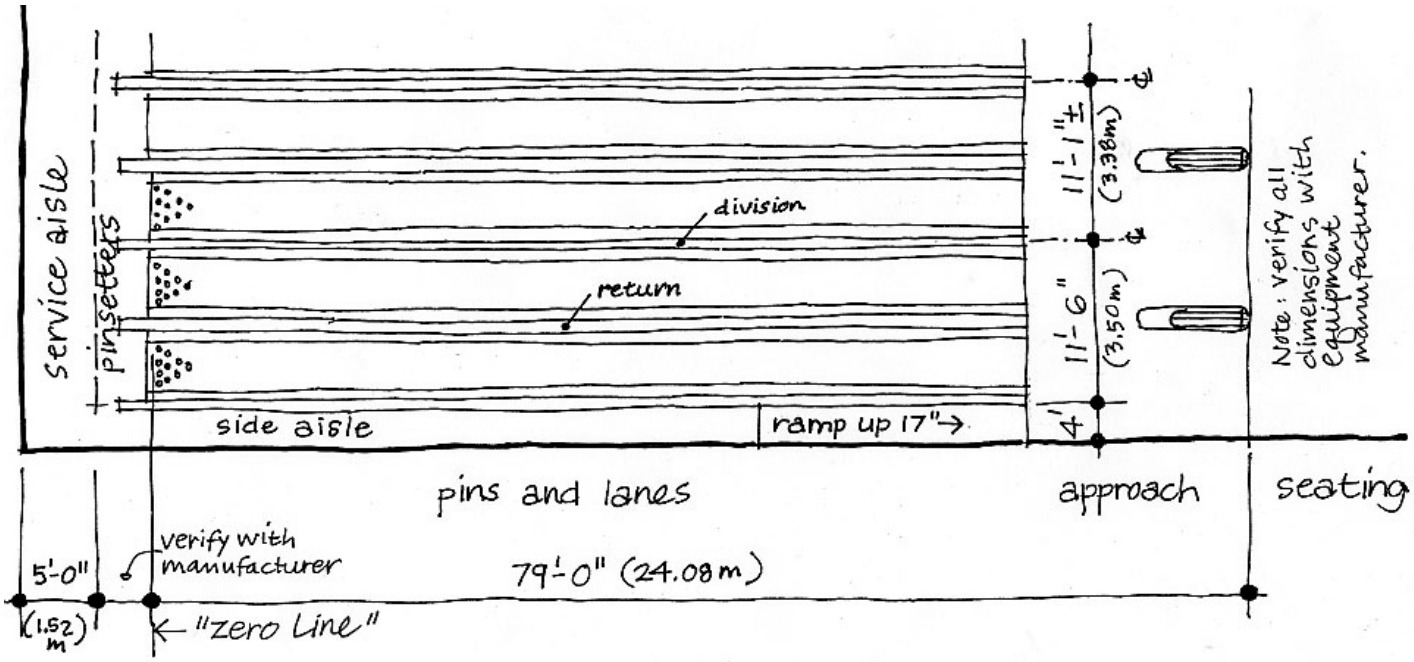
4-2.1 Lanes and Approaches

Size/Dimensions:

- Allow a length of 79'-0″ (24080 mm) from face of approach to back of pins (“zero line”). Verify this dimension with the equipment manufacturer.
- Provide approximately 11'-6″ (3510 mm) in width for the first and last sets of two uninterrupted lanes (at the side aisles). For each additional pair of lanes between these sets, add approximately 11'-1″ (3384 mm) in addition to any dimension required for columns. See manufacturer’s recommendations for exact dimensions.

- Provide a width of 4'-0" (1220 mm) for each of 2 side aisles parallel to the lanes.
- A clear span structure, open from the pins to the back of the concourse, is strongly preferred. The span should always be parallel to the lanes for future expansion flexibility. If a clear span is not possible and columns are required in the area of the lanes, they should not be more closely spaced than every 4 lanes (a minimum of approximately 24 feet or 7300 mm on center laterally). The approach area must be kept free of columns. Longitudinally, if columns are required, they should be placed midway along the lanes, and never closer than 2 feet (610 mm) from the foul line.

Figure 4-2: Bowling Dimensions Diagram



Finishes/Special Requirements:

- Use of synthetic lanes and approach area flooring with ultraviolet "glow" feature is preferred. In some locations and in existing centers, wood lanes may be used as appropriate.
- Include ball returns (1 per 2 lanes). Ball returns with lower level storage are recommended.
- Provide recessed slab at lanes and approach to receive lane and flooring support structure, in order to achieve a flush floor throughout the bowling area. Verify dimension of recess with manufacturer.
- Provide a ceiling height of about 12 feet (3660 mm). Use a flat ceiling with concealed fluorescent lighting, with provisions for "glow package" lighting.
- Lighting levels: 15-20 FC required at the lane surface; 5-10 FC suggested at the approach.

- Provide a “glow package” sound system.
- See Chapter 6 for other specialized requirements.
- Sidewalls should be on extension of the concourse design and not treated as display areas or for hanging banners.

4-2.2 Bowler Seating/Scoring and Spectator Seating

Size/Dimensions:

- Allow a depth behind the approach of 24 to 30 feet (about 7300 to 9200 mm) for bowler seating and scoring, and spectator seating. (Verify these dimensions with the seating manufacturer.)

Finishes/Special Requirements:

- Use “table and chairs” style furnishings for bowlers and spectators. (Provide 1 fixed table and about 7 seats per lane including spectator seating). This style of furnishings is available as proprietary systems. Consider “glow” type furnishings.
- Integrate scoring computers with bowlers’ seating furnishings (1 per lane).
- High top tables and chairs for spectators can improve their viewing position from the tables next to the concourse. Consider seating requirements for children in the design of these features.
- Integrate racks for house balls near or with spectator seating (5 balls per lane minimum; 8 to 10 recommended). Balls for youth programs should not be stored on the concourse, but are kept adjacent to reception storage (see 4-4.2).
- Provide a flat (single-level) floor throughout this area, at the same level as the concourse, approaches and lanes.
- Maintain adequate aisle width between seating elements to comply with egress and accessibility requirements. All seating elements must comply with ADAAG/ADA guidance.
- High ceilings are recommended for spaciousness and dramatic interest.
- Use concealed or indirect fluorescent lighting, such as in coffers or as decorative pendant lights, with additional recessed halogen spotlights over tables.
- Include provisions for “glow package” lighting and sound system.
- Lighting level: 10-15 FC suggested; 30-50 FC on tables. Avoid conflict in illumination with the brighter lanes and pins.
- Resilient flooring is recommended. (Carpeting should not be used anywhere within 10 feet (3048 mm) of the approaches and lanes.)
- Provide structural support, power, controls and dedicated grounding as required by manufacturers for their equipment.
- See Chapter 6 for other specialized requirements.

4-3 Mechanic's Area

Description/Relationships:

This area includes all of the "back of the house" support for the bowling activity.

4-3.1 Pinsetters, Service Aisle

Size/Dimensions:

- One pinsetting machine is required per lane. The depth of the space required for this pinsetting equipment will vary with the manufacturer, but assume about 4'-6″ (1370 mm) as a design allowance.
- The service aisle provides continuous access behind the pinsetting machines. A width of 5'-0″ (1520 mm) is recommended.
- The ends of the service aisle are typically the storage locations for the lane cleaning equipment. Ensure that adequate floor space is available, and that egress doors in these areas are not obstructed. Ramp the side aisles up to meet the level of the approaches.
- Provide a pair of 40 inch (1016 mm) wide doors at one end of the service aisle for equipment replacement. Doors must be at grade with the paved surface outside.

Finishes/Special Requirements:

- A masking unit over the pinsetting area conceals this space from the public portions of the Bowling Center. These units are sized at one per two lanes, and are supplied by the bowling equipment manufacturer. The graphic design and colors should be consistent with overall design of the bowling area.
- Provide a suspended gypsum board curtain wall behind the masking units (about 7'-6″ or 2290 mm from the back of pins) and 6'-0″ (1830 mm) above the lane surface. This will act as a sound buffer between the pinsetting machines and the public areas, and will provide a mounting surface for bowling equipment.
- Use concrete floors at the pinsetting equipment and service aisle.
- Lighting level: 30-35 FC suggested at the pinsetting equipment. Provide a high level of lighting at the pins that includes conventional and ultraviolet ("glow") lighting. Lighting is part of the pinsetting equipment, verify with the equipment manufacturer.
- Provide a double door to the exterior for pinsetting machine installation.
- Provide structural support, power, controls and dedicated grounding as required by manufacturers for their equipment. Wiring in conduit may not be appropriate in all cases.
- This area including the service aisle will be heated and cooled.
- See Chapter 6 for other specialized requirements.

4-3.2 Mechanic's Workroom and Storage

Size/Dimensions:

- Workroom should accommodate a 12 feet by 3 feet (3660 mm x 910 mm) workbench, plus computer and tools, pin cleaning machines, etc.
- Provide pin storage capacity for 2 rounds of pins per lane.

Finishes/Special Requirements:

- Provide sound isolation of the Workroom from the noise of the pinsetter area.
- Provide three separate dedicated storage rooms for the mechanic's supplies, pin storage, and lane maintenance equipment and supplies.
- Provide storage compartments in the mechanic's supplies room.
- Pin storage room must have dedicated humidity control.
- Provide fireproof metal cabinets for lane maintenance supplies and other combustible materials. Isolate hazardous materials and limit quantities to meet code requirements for a storage occupancy (Use Group S-1).
- Provide adequate exhaust ventilation.
- Provide a utility sink and laundry equipment in the Workroom.
- Lighting level: provide 75 -100 FC.
- This area will be heated and cooled.
- See Chapter 6 for other specialized requirements.

4-3.3 Mechanic's Toilet

Description/Relationships:

- Locate adjacent to and entered from the workroom.

Size/Dimensions:

- Provide a toilet room with one water closet and one lavatory, sized to meet accessibility standards.

Finishes/Special Requirements:

- Provide ceramic tile walls and ceramic or tile floor with a non-slip finish in compliance with ADAAG/ADA guidelines.
- See Chapter 6 for other specialized requirements.

4-3.4 Laundry

Description/Relationships:

- Locate adjacent to the workroom and entered from the service aisle.

Size/Dimensions:

- Provide a commercial grade washer and dryer.
- The room must be sized to meet accessibility standards.

Finishes/Special Requirements:

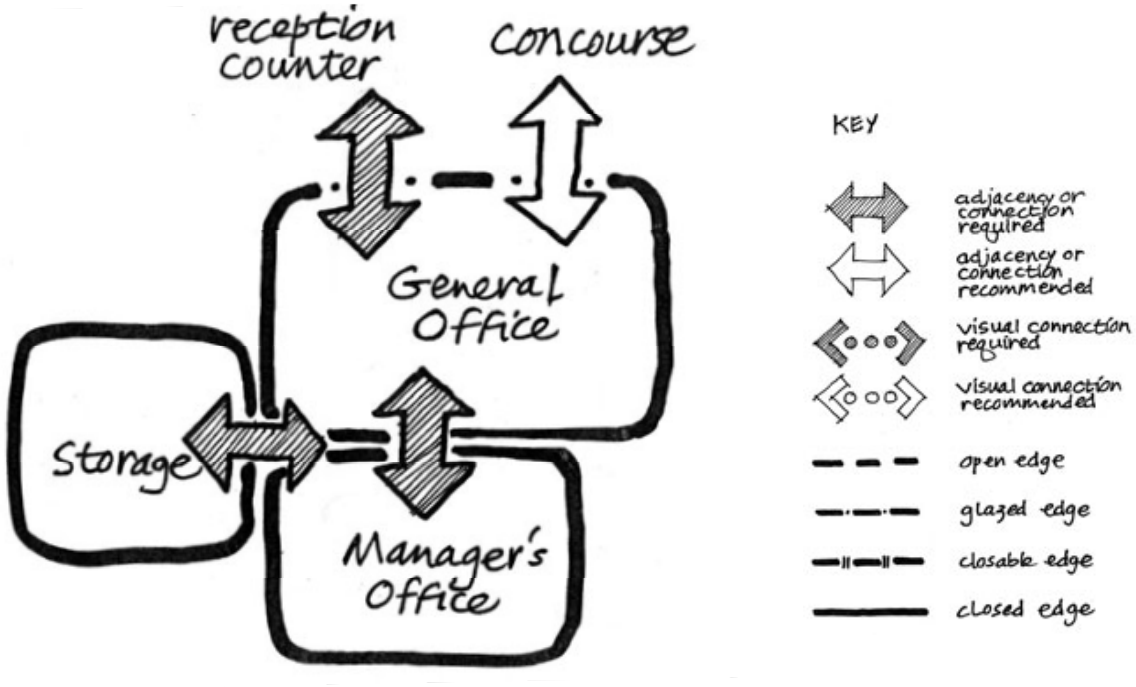
- Provide a counter top work area.
- Provide ceramic tile walls and resilient ceramic tile or quarry tile floor with a non-slip finish in compliance with ADAAG/ADA guidelines.
- See Chapter 6 for other specialized requirements.

4-4 Administration

Description/Relationships:

This area includes the reception and related storage, and the management offices. It is the point of customer contact for greeting patrons, general information and for administering the bowling activities. As such, the area should be visible from the main entry, and its design will play a key role in setting the tone for the Center. An overview of the concourse and lanes as well as of the café and games areas is essential for the Reception Counter, and a central location is important. Other administrative spaces should be conveniently accessible.

Figure 4-3: Administration Area Space Relationship Diagram



4-4.1 Reception Counter

Description/Relationships:

- The character should be that of a concierge counter, not a control podium. Establish a professional and inviting image for the counter through the lighting and signage. Consider electronic signage, such as alpha-numeric LED message displays.
- Locate so as to be immediately visible upon entering the Center.
- Provide visual surveillance of the concourse, seating areas and lanes, as well as oversight of the café and the games area.
- Adjacency to the café food service counter is particularly important at low-volume periods and in smaller Centers, so that a single staff member can operate both.
- Proximity to the games room can preclude a need for additional staffing for that area. Alternatively, electronic surveillance can be provided.
- Provide dedicated information display areas to limit clutter at the reception counter.

Size/Dimensions:

- Allow at least 12 linear feet (3660 mm) for point-of-sale terminals, receipt printers, score sheet printer, audio visual interface, pinsetter control boxes and computers

- Provide a counter height of 42 inches (1070 mm) for standing patrons, with a minimum counter length of 36 inches (910 mm) at a height meeting accessibility regulations (34 inch or 860 mm maximum).

Finishes/Special Requirements:

- Carpet is the recommended flooring, except for an area of resilient flooring at the patron side of the counter.
- Provide durable, attractive wall finishes, such as masonry, wood, or painted or vinyl-covered high impact gypsum wall board (not pre-finished wall panels).
- The counter should be well lit, inviting and easily identified by patrons. Enhance its image through lighting. Avoid the use of conventional recessed fluorescent fixtures at this focal point of the Center. A lighting level of 50 FC is recommended, with higher levels at accent lighting.
- Locate the main lighting, "glow package," PA and ceiling fan controls at the reception counter.
- Provide durable/hardwood edges on casework at exposed plastic laminate corners for protection.
- Integrate the point of sale terminal into the counter design with a recess to avoid blocking view and exposing equipment.
- Provide adequate space for glow package controls and stereo components.
- Locate an optional computer terminal kiosk at or near the Counter for league secretaries and for self-help individual/team printouts.
- See Chapter 6 for other specialized requirements.

4-4.2 Reception Storage

Size/Dimensions:

- Provide shoe storage, preferably in drawers, at 10 pairs per lane at the reception counter or in an adjacent storage alcove.
- Provide lockable drawers at the counter.
- Provide for storage of youth balls in an adjacent storage alcove on rolling racks.
- Provide storage of miscellaneous materials in the adjacent alcove.

Finishes/Special Requirements:

- Use utilitarian finishes, such as painted gypsum wallboard for walls, lay-in acoustical tile ceilings and resilient tile flooring.
- See Chapter 6 for other specialized requirements.

4-4.3 General Office

Description/Relationships:

- The general office will be the central administrative center for the Bowling Center.
- It should be secure so that it can be used as a place for handling cash.
- Locate adjacent to the reception counter for supervision, with a glass panel in the wall to the counter if possible.
- Locate near the Manager's office if possible.
- Design the space and furnishings as a good quality office complex, whose details support the theme of the whole Center.

Size/Dimensions:

- Allow an adequate area (as cited in Chapter 5) for two staff persons and one to two guests, plus equipment and furnishings.

Finishes/Special Requirements:

- Provide gypsum board walls, carpet flooring and acoustical tile ceilings. The décor should be consistent with that of the rest of the administrative area.
- Provide adequate lighting for work efficiency. Average lighting level should be 50 FC, with the ability to manually reduce lighting level for computer use.
- Provide communications connections for telephones, public address system, computer-based management records, the point-of-sale system, security tape equipment and monitors. Provide cameras at cash handling locations.
- Furnish the office with two desks and chairs for the staff, two armchairs for waiting visitors, file cabinets, and a work counter (containing computer based printing and reproduction equipment) for such activities as graphics production and document assembly.
- Make provisions for a safe to support cash handling operations (to be located to meet installation security standards).
- See Chapter 6 for other specialized requirements.

4-4.4 Manager's Office

Description/Relationships:

- Locate near the general office, with easy access to it. Provide a separate entrance from public circulation if possible.
- Design the space and furnishings as a good quality office complex, whose details support the theme of the whole Center.

Size/Dimensions:

- Allow an adequate area for the manager and two to three guests, plus equipment and furnishings (see the Space Allocation tables in Chapter 5).

Finishes/Special Requirements:

- Provide acoustical isolation so that the manager can have private conversations with staff and visitors.
- Provide gypsum board walls, carpet flooring and acoustical tile ceilings. The décor should be consistent with that of the rest of the administrative area.
- Provide adequate lighting for work efficiency. The average lighting level should be 50 FC, with the ability to manually reduce lighting level for computer use.
- Provide communications connections for the computer based management records, and the point-of-sale system.
- Provide one desk, a desk chair, two guest chairs, a computer, and file cabinets.
- See Chapter 6 for other specialized requirements.

4-5 Pro Shop

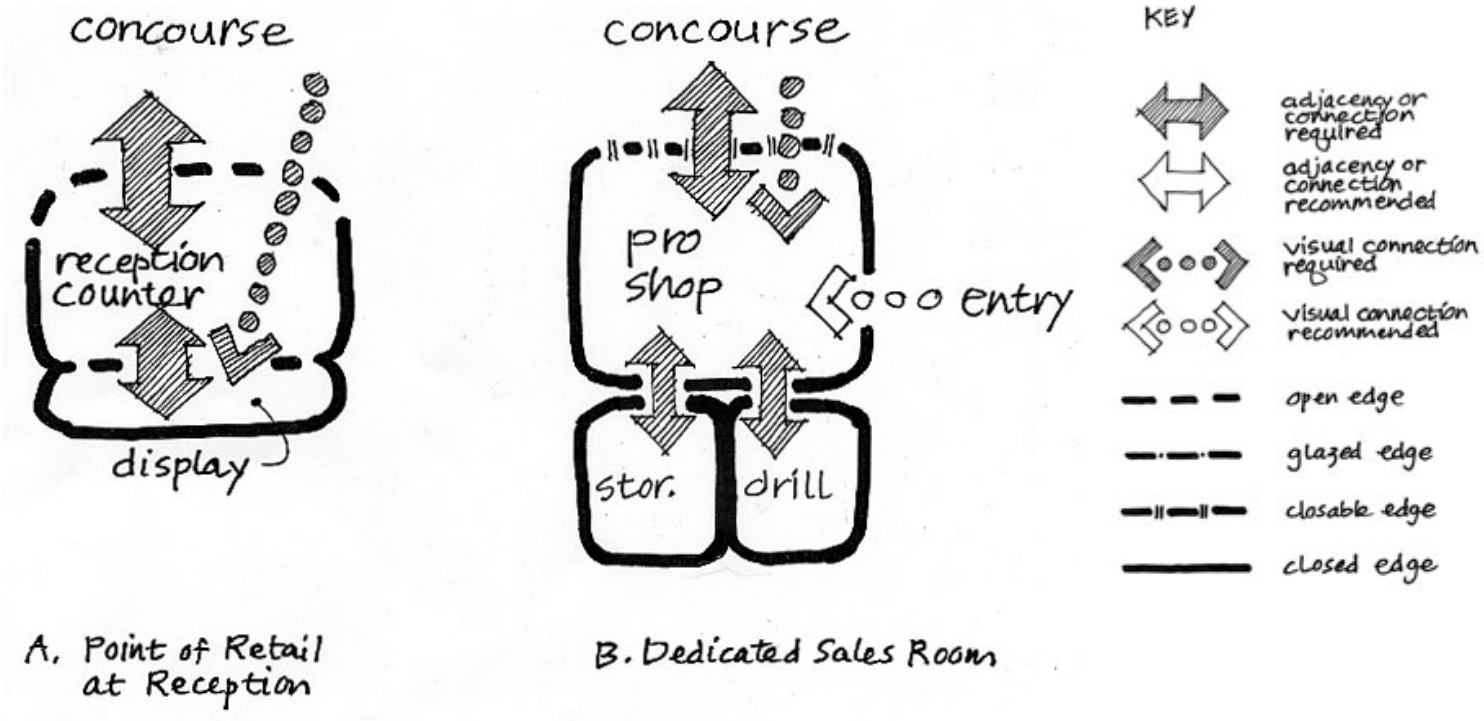
Peterson AFB - Colorado

Description/Relationships:

This retail area should be highly visible to patrons on the concourse. It includes a bowling product display and sales area at the reception counter or a separate dedicated display and sales room, depending on the market potential identified for the installation. In addition, a ball drilling room and a storage room is required. If not included as a point of retail at the reception counter, the sales display room should be located where it is clearly visible and easily accessed from the public circulation. Pro shop storage is preferred to be adjacent to the sales display area if space permits. The ball drilling equipment should be located in a separate room if space permits, or in the

mechanic's area. The latter is the more likely case in smaller Centers. Provide a dedicated exhaust system for the ball drilling work space.

Figure 4-4: Pro Shop Space Relationship Diagram



4-5.1 Sales Display and Storage

Size/Dimensions:

- Provide shelving and display cases for the retail sales operation at the reception counter. Verify extent and nature of retail products to be displayed.
- Alternatively, for a separate pro shop sales display room: allow 300 to 400 square feet of space, visible and directly accessible from the public circulation.

Finishes/Special Requirements:

- Provide security for display and sales areas with a lockable rolling screen.
- Provide adjustable accent lighting for product display elements.
- A lighting level of 50-100 FC is recommended for display.
- Consider skylights for ambient light.
- Consider a coordinated display system such as slot wall.

- Storage should include product inventory, and be convenient to the sales display area if possible.
- A lighting level of 30 FC is recommended for the storage area.
- Provide gypsum board walls, carpet flooring and acoustical tile ceilings.
- See Chapter 6 for Specialized Requirements.

4-5.2 Drill Room

Description/Relationships:

- Locate within the mechanic's area or in a dedicated room at the pro shop in large Centers.
- May be optional in 16 lane and smaller Centers.

Size/Dimensions:

- Space for ball drilling machine and operator.
- Provide storage for supplies for ball drilling.

Finishes/Special Requirements:

- Provide sound control, and an exhaust system for dust control.
- Provide structural support, power, controls and dedicated grounding as required by the equipment manufacturer.
- Provide a service sink.
- See Chapter 6 for other specialized requirements.

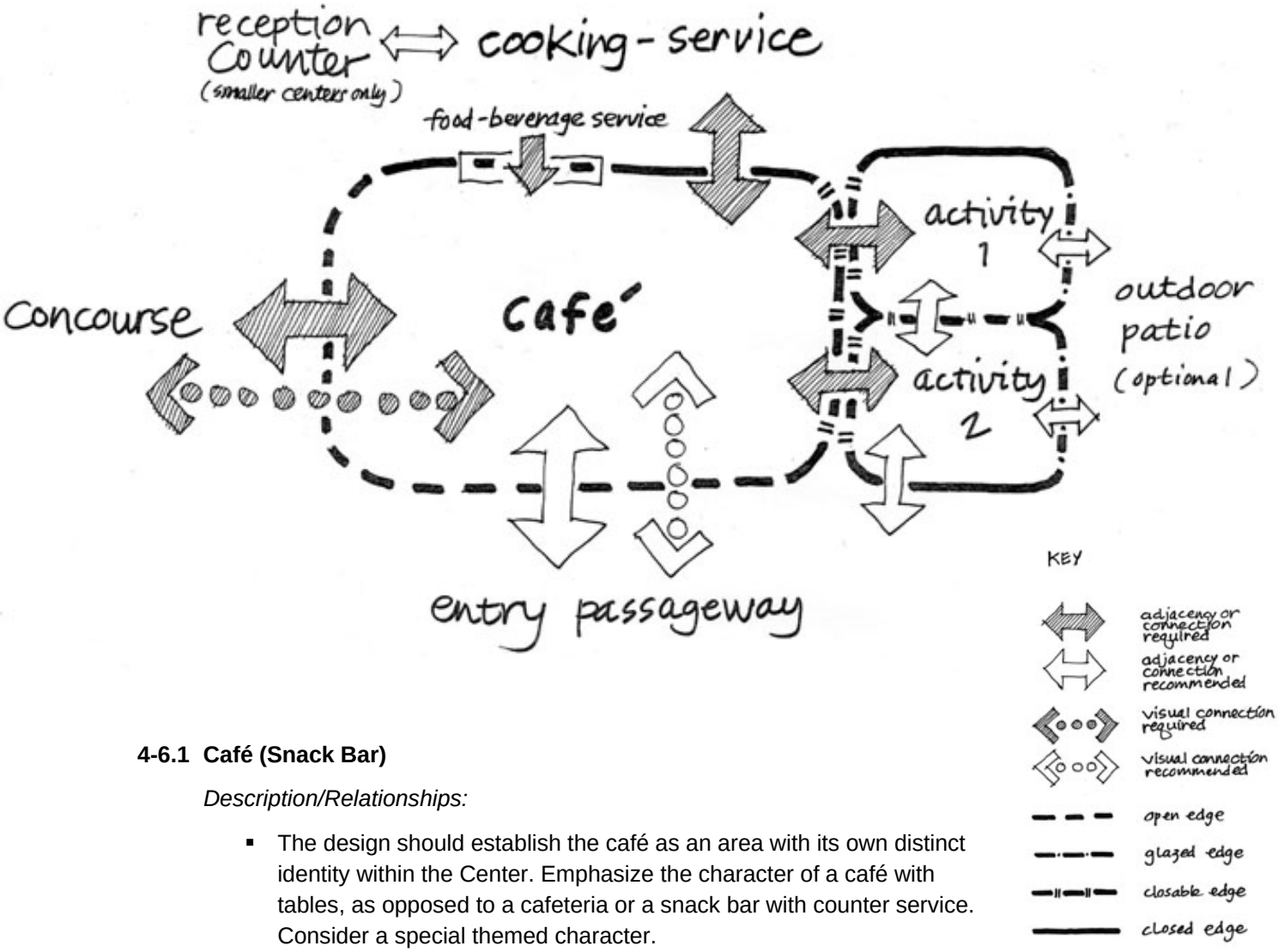
4-6 Dining

This area includes the café and party rooms, and optional lounge and bar facilities. Dining is a key functional area meeting the needs of both bowlers and non-bowling patrons, and is an important revenue source for the Center. With a highly visible, central location and an open, lively appearance, it can be the activity that ties together all of the other activities of the Center.

Dining service is informal. Patrons order and pick up their food at a service counter. Generally, disposable ware is used. A typical menu for food service programming

is included in Chapter 6. Where the climate allows, an outdoor dining patio may be a valuable addition.

Figure 4-5: Dining Area Space Relationship Diagram



4-6.1 Café (Snack Bar)

Description/Relationships:

- The design should establish the café as an area with its own distinct identity within the Center. Emphasize the character of a café with tables, as opposed to a cafeteria or a snack bar with counter service. Consider a special themed character.
- Consider skylights for ambient light and to reinforce the special café character of the space. Provide windows at exterior walls.
- Locate the café so as to be immediately visible to patrons upon entering the Center.
- Locate to be visible from and convenient to the bowlers' and spectators' seating.
- Emphasize the connection between the café and the public circulation. The bowling area should be visible to diners.
- Provide access to an outdoor dining patio, if this feature is provided.
- Provide a serving counter or window; not a counter with stools.

- Provide well designed, tasteful signage. Avoid typical vendor-supplied menu boards and illuminated signage.

Size/Dimensions:

- Provide circulation space in the serving counter area, at least six feet wide so that patrons accessing the counter do not interfere with dining activities.
- Provide easy, sequential patron traffic flow to and from the service point and tables.
- Provide 15 square feet per seat (net seating area) in the café for casual dining activity.
- Maintain adequate aisle width between seating elements to comply with egress and accessibility requirements.

Finishes/Special Requirements:

- Provide a mix of movable tables, primarily for four seats, allowing them to be reconfigured for different events. Rectangular tables are recommended for greatest flexibility. "Glow" type furnishings are not appropriate.
- Carpet is the recommended flooring, with resilient flooring at the service area. Carpet should be consistent with and support the theme and character of the space. It should be commercial grade, low maintenance with stain-hiding patterns, in compliance with USAF Interior Design Guide (as cited in Appendix A).
- Provide durable, attractive wall finishes, such as brick, wood, or painted or vinyl-covered gypsum wall board (do not use pre-finished wall panels).
- Provide incandescent lighting, utilizing adjustable accent lighting for dramatic effect. Consider indirect fluorescent lighting in coves. Avoid conventional exposed fluorescent lighting. An average lighting level of 30 FC is recommended.
- See Chapter 6 for other specialized requirements.

4-6.2 Activity Rooms

Description/Relationships:

- Activity or party rooms are available for private parties as an additional revenue source for the Center. At other times they can be opened to the café for an expanded dining area.
- Circulation to enter the activity rooms can move through the café space, but they should each be capable of independent use. The activity rooms may also be combined with each other and/or with the café area into larger spaces by opening moveable walls.
- Direct access to an outdoor dining patio is useful, if this feature is provided.
- Consider skylights or windows for ambient light and to reinforce the welcoming character of these spaces.

Size/Dimensions:

- Each room should accommodate about 12 to 20 occupants seated at tables.

- Provide 15 square feet per seat in the activity rooms for dining activity.

Finishes/Special Requirements:

- Provide a mix of movable tables, primarily for four seats, allowing them to be reconfigured for different events. Rectangular tables are recommended for greatest flexibility.
- Moveable walls must provide acoustical isolation, and be durable and easy to operate. Hotel-type panelized systems, finished to match the other walls, are recommended. (Accordion doors are not recommended.)
- Provide durable, attractive wall finishes, such as masonry, wood, or painted or vinyl-covered gypsum wall board (do not use prefinished wall panels).
- Carpet is the recommended flooring.
- Provide recessed lighting, utilizing adjustable accent lighting for dramatic effect. Consider indirect fluorescent lighting in coves. Avoid conventional exposed fluorescent lighting. An average lighting level of 30 FC is recommended.
- See Chapter 6 for other specialized requirements.

4-6.3 Lounge/Bar (Option)

Description/Relationships:

The lounge/bar is a possible addition to the activity spaces of the Bowling Center and will be a space directed towards adult use. It will have a full service sit-down bar for beer, wine and mixed drinks. If possible, locate this bar contiguous to the food service area to share

equipment for draft beer and bottle storage. If not, provide a dedicated storage room for the lounge/bar.

The lounge/bar will possibly include games such as billiards and other table games, darts, and shuffle board. Multiple TV monitors may be appropriate, particularly if the space has a sports theme.

- The design should establish the lounge as a distinctive space within the Center. Establish a unique character, possibly with a theme, for customer appeal and to differentiate it from the cafe.
- Consider skylights or windows for ambient light.
- Locate so as to be clearly identifiable and easily accessible from the public circulation.
- Separate the lounge from the café and concourse to ensure that there is no conflict between alcohol sales and children's activities.
- Provide enclosure for the lounge and lockable doors.

Size/Dimensions:

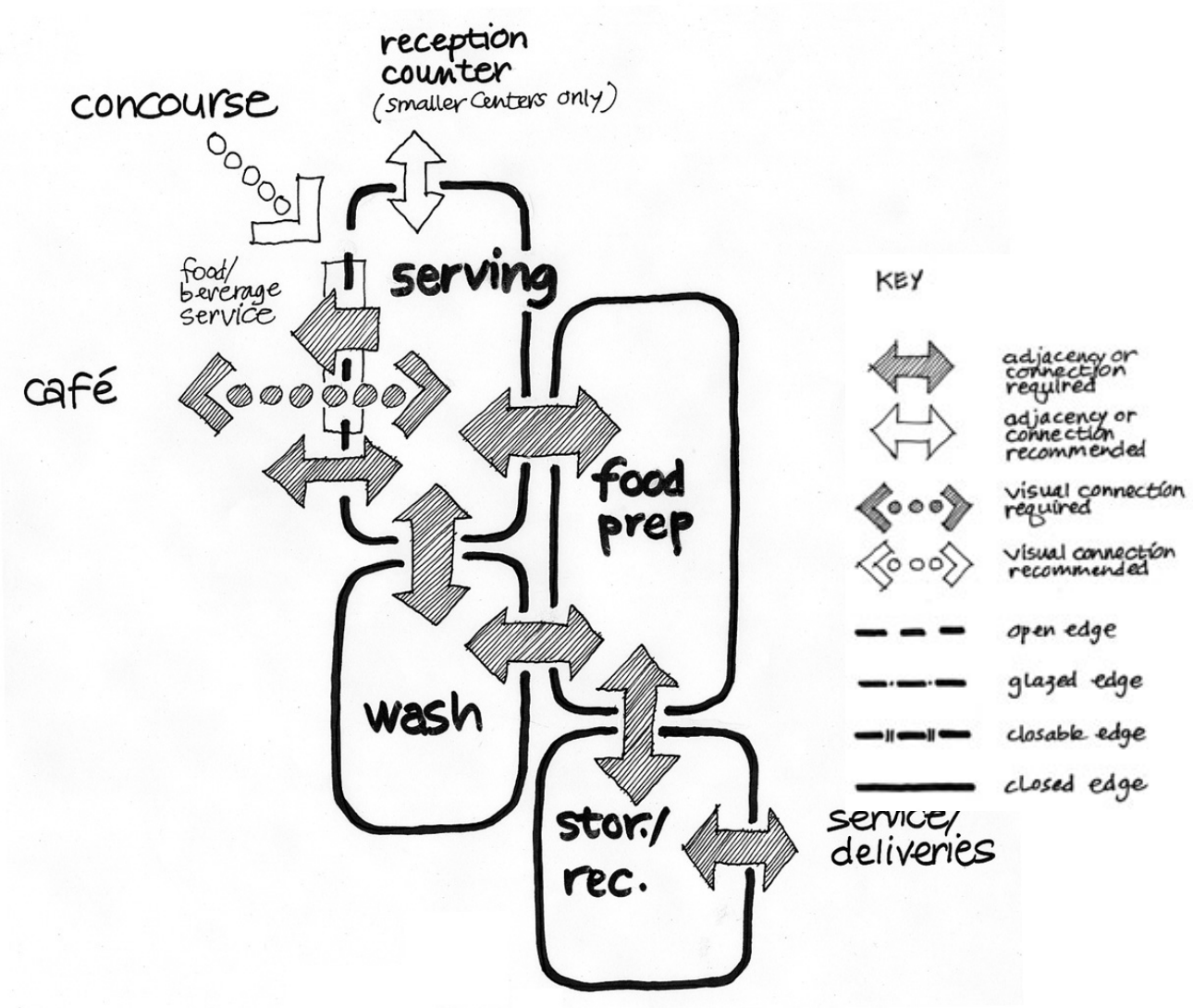
- The capacity of the lounge will depend on the market demand determined at the installation.
- Provide 15 to 20 square feet (1.4 to 1.8 square meters) per person in the lounge for table seating.
- Maintain adequate aisle width between seating elements to comply with egress and accessibility requirements.

Special Requirements:

- See Chapter 6 for other specialized requirements.

4-7 Food/Beverage Service

Figure 4-6: Food Service Area Space Relationship Diagram



4-7.1 Food Service Counter

Use Description:

The food service counter is the primary serving area for the Bowling Center. There is no food production generated in this area other than snack food. Primary activity in this area is order taking and delivery, and the serving of snacks and concessions. A pass-through window into the cooking line area provides all cooked food to the cashier. The bar service is directly connected to this area to minimize labor.

Relationships and character:

- Provide access to the cooking line, bar service, food preparation, and storage areas.
- Provide good visibility from the café and bar service area.
- All snack warmers should be central to the food service counter and the bar service counter.
- A condiment station should be located adjacent to the counter. This station should function as the area in which the customer can get any cold toppings or condiments, napkins and utensils. An attractive presentation of this element is critical to the appearance of the entire café area.
- Consider utilizing self-service for items such as beverages, soups, salads, and pre-prepared foods.

Dimensions and furnishings:

- Allow for aisle circulation width of a minimum of four feet (1220 mm) and a maximum of five feet (1520 mm).
- Provide 24 inch (610 mm) wide overhang on front counter for food placement.
- Allow for 2'-6″ to 3'-0″ (710 to 910 mm) deep for counters and undercounter equipment.
- The overall length of the serving area should be between 10'-0″ to 15'-0″ (3050 to 4570 mm) long for service and snack equipment.
- Allow for clear counter top space for display racks for snacks, chips or cookies.
- Allow for a 2'-6″ wide by 10'-0″ long by 3'-0″ high (760 mm by 3050 mm by 910 mm) condiment counter.
- Facilities larger than 24 lanes will require additional point-of-sale systems.

Room finishes:

Refer to Chapter 6.

Technical requirements:

- Provide electric outlets along both counters.
- Provide a data port connection for point-of-sale system.
- Run soda and beer conduits under slab, originating from food storage area.
- HVAC system must be sized properly for odor control and negative pressure.

4-7.2 Bar Service Counter

Use Description:

The bar service counter is where all liquor and beer service is generated for the café. This function should typically be adjacent to and a continuation of the food service counter. There should be snacks available for service in this area for when the kitchen closes and for people

that do not want to order entrée items. The bar service area serves primarily bottled beverages, including beer, wine and liquor (miniatures), and draft beer is also dispensed via a direct draw beer cooler.

If the Center includes a lounge, there should be a dedicated bar service area, possibly including a patron bar, in that activity area. Coordinate bottle storage and beer cooler locations for efficiency between the two bar service areas.

Relationships and character:

- Locate adjacent to the food service counter and warewashing.
- Provide good visibility from the dining room and reception area.
- Snacks should be spaced equally between this area and the food service counter.
- There should be space on the back counter for liquor display racks (miniatures).

Dimensions and furnishings:

- Aisle width in bar service area should be a minimum of 3'-6" (1070 mm) and a maximum of 4'-6" (1370 mm).
- Provide 24 inch (610 mm) wide counter top for beverage service and production.
- Allow for 2'-6" to 3'-0" (760 mm to 910 mm) deep for counters and undercounter equipment.
- Allow for clear counter top space for point-of-sale systems.
- Allow for a 6 inch (150 mm) thick low wall or “dye” to run plumbing and electricity behind bar equipment.
- The overall length of the serving area should be between 7'-0" to 10'-0" (2130 mm to 3050 mm) for service and snack equipment.
- The overall length should be between 15 and 20 feet (4570 and 6100 mm) for the optional lounge/bar area.
- Typically serving ware will be disposable; if glass or ceramic table ware is used, washing equipment should be provided.

Room finishes:

Refer to Chapter 6.

Technical requirements:

- Provide GFI electric outlets along both counters and under bar top. Coordinate power supply with equipment requirements.
- Provide a data port connection for point-of-sale system.
- Soda and beer conduits are recommended to run under slab from refrigerated storage area, especially when the optional lounge/bar area is provided.
- HVAC system must be sized properly for odor control and negative pressure.

4-7.3 Cooking Area

Use Description:

The cooking line is where all food production occurs. All hot food production is pre-made or cooked to order and fed through the heated display case as ordered. The heated display case should be situated close to the bar service counter as well as the food service counter to allow patrons to only have to wait in one line to order food and beverages.

Relationships and character:

- Provide access to the serving line area (via pass-through window), bar service area, food preparation and storage areas.
- This area should be closed off (except for the pass-through window) to public visibility.

Dimensions and furnishings:

- Aisle width in cooking line area should be a minimum of four feet (1220 mm) and a maximum of five feet (1520 mm).
- Allow for 3'-0" to 3'-6" (910 mm to 1070 mm) deep for equipment, on both the cooking battery side and the service side.
- Allow for a minimum length of 20 feet (6100 mm) total for cooking area and a maximum of 30 feet (9140 mm).
- Allow for 2'-6" to 3'-0" (760 mm to 910 mm) deep for counters, work tables, sinks and refrigerators.

Room finishes:

Refer to Chapter 6.

Technical requirements:

- Provide a data port connection for point-of-sale system.
- Coordinate power supply with equipment requirements.
- Natural gas is preferred, if available, for cooking appliances.
- HVAC system sized properly for odor control and negative pressure.
- Building HVAC to provide 80 percent of exhaust make-up air.
- Provide dedicated electrical service for the Ansul fire protection system at the hoods from the fire alarm control panel.
- A lighting level of 70 to 100 FC is recommended.

4-7.4 Food Preparation Area

Use Description:

The food preparation area is where all menu items are prepped for service. All dish and ware washing functions occur in this area along with ice production.

Relationships and character:

- This area should be central to the cooking serving line, serving line, bar service, and all storage facilities.
- This area should be closed off to the public visibility.

Dimensions and furnishings:

- This area should be fairly open to allow for mobile work stations.
- Allow 2'-6" to 3'-0" (760 mm to 910 mm) depth for all work tables, sinks and refrigerators.
- Three-compartment sinks are typically required by code.
- Dish machines are optional for all sizes of Centers. If banqueting, catering, or lounge services will be offered, a dish machine is strongly recommended. It may not be necessary in smaller facilities that are utilizing all disposable plates and utensils.
- Aisle width in prep area should be a minimum of three feet (910 mm) and a maximum of five feet (1520 mm).
- The overall length of the prep area should be between 10 feet to 20 feet (3050 mm to 6100 mm) long, with space for equipment on both sides of the room.

Room finishes:

Refer to Chapter 6.

Technical requirements:

- Provide electrical outlets for mobile equipment, coordinated with equipment manufacturers.
- HVAC system sized properly for odor control and negative pressure.
- Pulper may be preferred in some jurisdictions where waste disposers are not allowed by code.
- 140º F (60º C) incoming temperature to kitchen for dishwasher (dedicated water heater).
- Remote and / or fully recessed grease trap
- A lighting level of 70 - 100 FC is recommended.

4-7.5 Food Storage

Use Description:

All dry goods, perishables, soda, beer, and frozen food items shall be stored in this area. This area should primarily be used for storing food products only but could accommodate small wares such as disposable plates, cups, and utensils. The areas should be large enough to accommodate storage shelving and rolling carts.

Relationships and character:

- This area should be located centrally to the food preparation area and the supervisor/delivery area.

Dimensions and furnishings:

- The size of storage components will vary according to frequency of deliveries.
- Allow room for shelving and three feet (910 mm) of circulation space in front of each shelf.
- Storage capacity is in direct relationship with the frequency of deliveries. Fewer deliveries will require larger storage facilities, where frequent deliveries will require smaller storage areas.
- For dry storage, allow for a minimum width or depth of 7'-6" (2290 mm) interior dimension for small facilities and 10'-0" (3050 mm) for large and medium facilities.
- Smaller units may not require a dry storage facility of this size. The minimum requirements to consider when designing the storage space is 24 inches (610 mm) deep shelving (length as required) and three feet (910 mm) wide aisles. A minimum of two (2) five feet (1520 mm) long shelves should be considered.
- Provide a locked cabinet for liquor (miniatures).

Room finishes:

Refer to Chapter 6.

Technical requirements:

- Run soda and beer conduits under slab to the food service and bar counters.
- Provide air circulation for compressors and beer systems.
- Provide drains for evaporator coils.
- A lighting level of 30 FC is recommended.

4-7.6 Receiving Office

Use Description:

This area, if provided, should be used by the primary supervisor. This is where all orders for supplies are placed and received. It is also where daily kitchen management functions should be conducted.

Relationships and character:

- This area should be central to all major functions within the food service area to allow for receiving and management functions.
- Provide a glazed wall for visual connection to other kitchen spaces.

Dimensions and furnishings:

- It is recommended that this area be a separate room.

- A desk, chairs, and filing cabinets are the primary furnishings in this space.

Room finishes:

Refer to Chapter 6.

Technical requirements:

- Provide electrical outlets.
- Provide a data port for point-of-sale information from the serving counter.
- Consider an insect control fan at the door to the exterior.

4-7.7 Outdoor Dining-Patio (Option)

Description/Relationships:

The outdoor dining patio is a possible addition to the activity spaces of the Center. If justified in the market analysis, it will provide an extension of the indoor dining areas. Typically, the patio will be self service and not staffed. Locate the patio contiguous to and directly accessible from the cafe and/or activity rooms.

- The design should create a special outdoor space for the patio, separated from other site uses.
- Establish the character of the patio using landscape elements such as planting, low walls and screening fences, and trellises or pergolas.

Technical requirements:

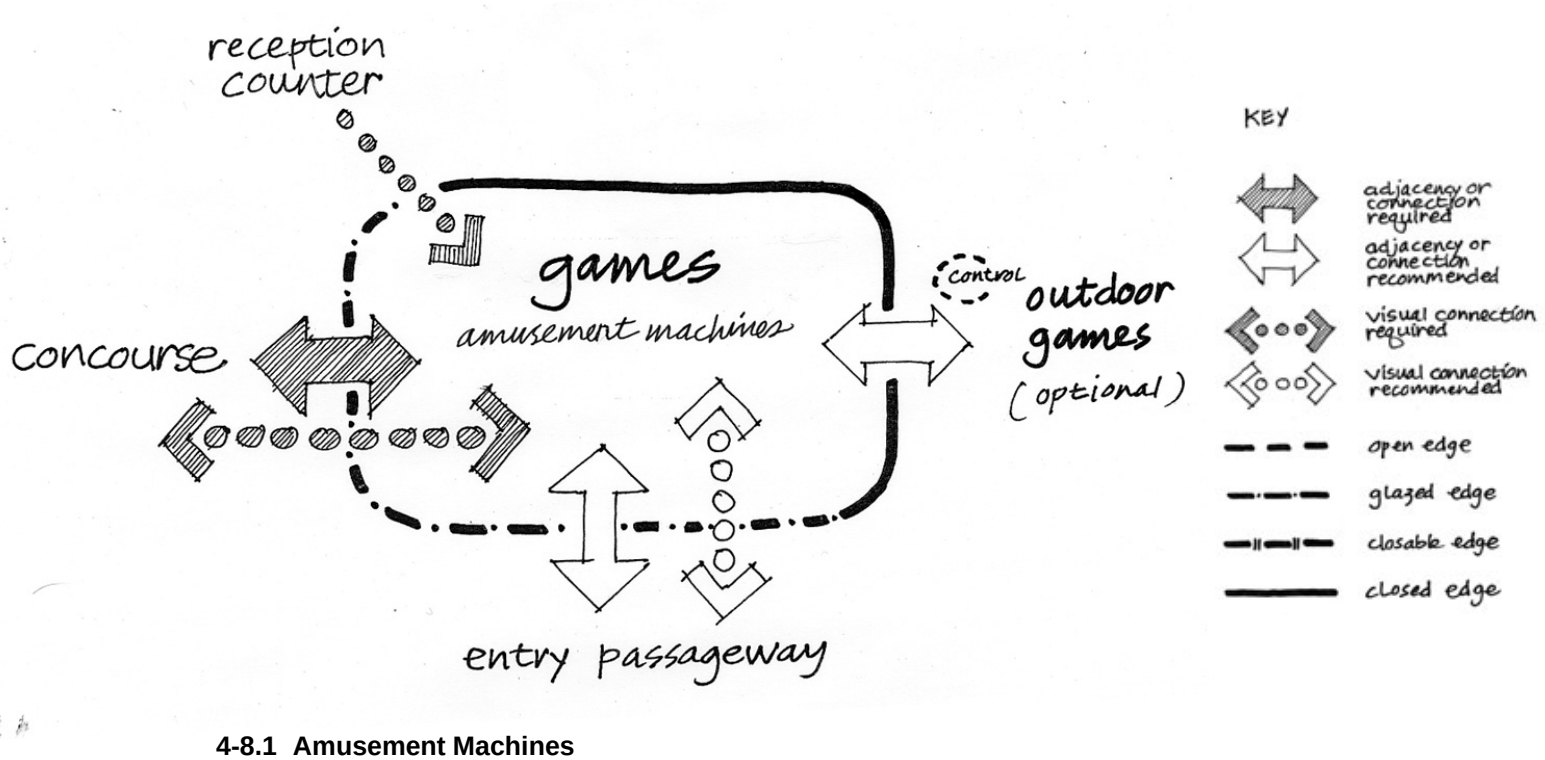
- Provide a stationary gas hook-up for a portable charbroiler/grill.
- Provide covered and protected storage for a portable charbroiler/grill.
- Provide post-mounted lighting for evening and nighttime use.
- Provide electric and POS outlets for support equipment.
- Consider heaters or misters for climate control.

4-8 Games

Games include all varieties of interactive games, including table games, outdoor games, and electronic games that are sometimes termed an “arcade”. Games are a key activity that meets the needs of both bowlers and non-bowling patrons, and, like dining and bowling, are an important revenue source for the Center. The primary indoor electronic games, identified collectively as amusement machines, require a highly visible, central location where their activity can contribute to the energy level of the whole Center. Amusement machines also tend to be noisy, and the space needs to be enclosed with glass and walls. Quieter table games are best located in their own area, such as in a lounge if one is provided. Outdoor games are generally those which require a greater amount of space than can typically occur within the building.

The new model Bowling Center will emphasize games as a major activity component. The number and types of games, and therefore the size and nature of the games area or areas, will depend on the local market as established by the Needs Assessment Study. The appropriate design could range from a few traditional “arcade” machines to a major games complex including virtual reality machines, an area of table games, and an outdoor games area. Centers located in installations overseas will usually include slot machines in dedicated spaces. Amusement machines and other game equipment need to be actively managed, so that they are well maintained and updated regularly to keep the customers’ interest. The Air Force Services Agency provides the amusement game equipment and its management, as well as related signage.

***Figure 4-7:* Games Area Space Relationship Diagram**



4-8.1 Amusement Machines

Description/Relationships:

- Provide dedicated areas for amusement machines, regardless of the type and number. Do not locate amusement machines in the concourse area or elsewhere on the public circulation.
- The design should establish the games as a distinct area within the Center. Emphasize the energetic and active character of the games with the design of the space.
- Locate so as to be immediately visible to patrons upon entering the Center.
- If possible, locate near other primary activity areas, and visible from and convenient to the bowlers' and spectators' seating.
- Emphasize the visual connection between the games and the public circulation. The bowling area should be visible to patrons of the amusement machines.
- If the games area is not visible from the reception counter, provide a CCTV system for management control.

Size/Dimensions:

- Allow 500 to 600 square feet (46 to 56 square meters) for a small games activity area (15 machines). A medium size area with 30 units will require about 1,000 to 1,500 square feet (93 to 139 square meters). As much as 3,000 to 5,000 square feet (279 to 465 square meters) should be allowed for a large games area with 50 units.

Verify the appropriate planning factor (square feet area per game) with the games management organization or with the manufacturers of the equipment

- Maintain adequate aisle width between machines to comply with egress and accessibility requirements, and to allow for spectators at featured games.

Finishes/Special Requirements:

- Create an interior environment that is complementary to the amusement machines and features their lighting and graphic displays. Allow for changes in games technology.
- Avoid uncontrolled daylight. Windows are generally not desirable; however, obscure glazing such as glass block near the main entrance can communicate a sense of the interior lighting and activity to approaching patrons.
- Provide durable, attractive wall finishes, such as masonry, wood, or painted or vinyl-covered high-impact gypsum wall board (do not use pre-finished wallboard).
- Carpet is the recommended flooring.
- Keep lighting levels low for dramatic impact. Provide recessed incandescent lighting, with adjustable accent lighting. Use indirect fluorescent lighting with colored gel sleeves for special effects. Avoid conventional exposed fluorescent lighting. If used, neon must be protected from abuse.
- Provide coin-operated lockers for patrons use.
- Provide structural support, power, controls and dedicated grounding as required by manufacturers for their equipment.
- Provide power outlets and communications boxes 6 feet on center around the room and in the ceiling or floor at the center of the space.
- See Chapter 6 for other specialized requirements.

4-8.2 Lounge Games (Option)

Description/Relationships:

- Lounge games refer to non-mechanized table games that require a quieter or more restrained environment for their enjoyment. Examples include billiards, foosball and similar games, darts, and shuffle board.
- The design should locate these games in a distinct, enclosed area within the Center. If a lounge/bar is not provided, a similar dedicated space can be provided. Emphasize the character of the games with the design of the space. Visibility from the public circulation is desirable.

Size/Dimensions:

- The space requirements vary dramatically, depending on the type and number of games to be accommodated. Verify the appropriate planning factor (square feet area per game) with published standards or with the manufacturers of the equipment

- Maintain adequate aisle width between games to comply with egress and accessibility requirements.

Finishes/Special Requirements:

- Avoid uncontrolled daylight. Large windows are generally not desirable; however, well-designed windows or skylights can provide a welcoming environment.
- Provide durable, attractive wall finishes, such as masonry, wood, or painted or vinyl-covered gypsum wall board (do not use prefinished wall panels).
- Carpet is the recommended flooring.
- Keep lighting levels low for dramatic impact. Provide recessed incandescent lighting, with adjustable accent lighting to provide 30 FC over games tables. Avoid conventional exposed fluorescent lighting.

4-8.3 Slot Machines (OCONUS option only)

Description/Relationships:

- This activity includes all games that include an element of gambling, including slot machines, video poker and redemption arcade games. DoD regulations prohibit these games at installations within the continental United States.
- Provide a dedicated, enclosed area for slot machines and similar games, regardless of the type and number. Access must be able to be limited to authorized patrons.
- The design should establish the games as a distinct area within the Center. Create an interior environment that is complementary to the amusement machines and their graphic displays.
- Typically this games area will be controlled from a cashier's window. If appropriate, provide a CCTV system for management control.

4-8.4 Outdoor Games (Option)

Description/Relationships:

- This activity includes all games that require a large area for their operation, including batting cages, mini golf, and laser tag. While these could be located indoors, in most Centers, space limitations will dictate that they occur outdoors.
- Provide a dedicated, fenced area for outdoor games, regardless of the type and number. Access must be able to be limited to paying patrons. Provide appropriate lighting for nighttime operation.

4-9 Building Services and Storage

4-9.1 Custodial

Description/Relationships:

- Locate to be convenient to and accessible from the public circulation and major activity areas.

Finishes/Special Requirements:

- Provide resilient flooring or exposed concrete floors, and CMU or gypsum board walls, and an acoustic tile ceiling.
- Provide a service sink and a mop receptacle.
- Provide GFI-equipped electrical outlets.
- A lighting level of 50 FC is recommended.
- See Chapter 6 for other specialized requirements.

4-9.2 Mechanical/ Electrical/ Communications

Description/Relationships:

- Provide separate rooms for mechanical (HVAC), fire protection, electrical, and communications equipment.
- Locate the communication room to be accessible to staff within the building.
- Locate the mechanical, fire protection and electric rooms to be accessible only from the building exterior.

Size/Dimensions:

- Provide a combined space for these rooms equal to approximately 5 percent of the net building floor area.

Finishes/Special Requirements:

- Provide exposed concrete floors and CMU or gypsum board walls, with the appropriate fire separation rating.
- A lighting level of 30 FC is recommended.
- See Chapter 6 for other specialized requirements.

4-9.3 General Storage

Description/Relationships:

- This space provides storage for seasonal materials, extra furnishings and miscellaneous items.
- Locate the general storage to be accessible to staff handling bulky items.

Finishes/Special Requirements:

- Provide resilient flooring or exposed concrete floors, CMU or gypsum board walls, and an acoustic tile ceiling.
- A lighting level of 30 FC is recommended.
- See Chapter 6 for other specialized requirements.

Chapter 5 Illustrative Designs

The Bowling Center should be sized to economically accommodate the programs that are planned for the specific installation. The primary activity areas described above and listed in Table 1-1 should serve as a modular framework for the design of a particular Center. As illustrations, three example facilities are described below. A range of facility sizes, as appropriate for 12, 24 and 32 lane Bowling Centers characterizes these examples. Tables 5-1, 5-2 and 5-3 indicate the relative sizes for the programmed spaces and support functions for this range of facility sizes.

The three example designs share a common organization of their functional spaces. This approach illustrates a modular basis for the planning of Centers of any size. The arrangement of the plans establishes the key adjacencies and interaction between the primary program areas as a common denominator to all the designs. This consistent organization can be expanded or contracted to suit the size and other program requirements of each particular base.

See following pages for Example Plans and Space Allocation Tables.

5-1 12 Lane Center

The 12 lane Bowling Center represents the smallest facility size likely for new freestanding construction. The centralized organization provides a basis for adjustments to accommodate other sizes and for the unique requirements of renovation projects.

Figure 5-1: Example Plan for 12 Lane Center

Table 5-1: Space Allocation for 12 Lane Center

			AREA IN SF	AREA IN m^2
Nominal Total Constructed Area: (Gross Area)			***16,000***	***1,500***
Programmed Areas (Net Area)				
Bowling	Lanes		5,930	551
	Bowler and Spectator Seating		2,250	209
	Concourse		1,000	93
Mechanics	Mechanic's Workroom		240	22
	Mechanic's Storage		100	9
	Lane Maintenance Storage		80	7
	Pinsetting		340	32
	Pin Storage		100	9
	Service Aisle		380	35
Dining	Café (Snack Bar)		700	65
	Activity Rooms		325	30
Food/ Beverage	Service Counter		90	8
	Bar Service Counter		60	6
	Cooking Area		220	20
	Food Preparation		120	11
	Storage		70	7
	Refrigerator/freezer		30	3
	Receiving		--	--
Games	Amusement Machines		600	56
Pro Shop	Display Sales Room		(at Reception Counter)	(at Reception Counter)
	Drill Room		80	7
	Pro Shop Storage		100	9
Administration	Reception		150	14
	Reception Storage Alcove		75	7
	Manager's Office		100	9
	General Office		180	17
Support	Patron Toilets		350	33
	Lockers/Vending		100	9
	General Storage		175	16
	Custodial		50	5
	Subtotal of Programmed Area (Net)		***13,995***	***1,300***
Walls, Circulation, Overhangs	*% of Programmed Area:*	*8%*	1,120	104
	Subtotal of Building Area (Gross)		***15,115***	***1,404***
Mechanical, Electrical, Communications	*% of Building Area:*	*5.0%*	756	70
Total Constructed Area (Gross Area)			***15,870 (Area in SF)***	***1,474 (Area in m^2)***

* This is based on industry standards: Local conditions may require other sizes

5-2 24 Lane Center

The 24 lane Center represents a moderately large size for new construction. The centralized organization permits adjustments for larger and smaller Centers and for renovation projects.

Figure 5-2: Example Plan for 24 Lane Center

Table 5-2: Space Allocation for 24 Lane Center

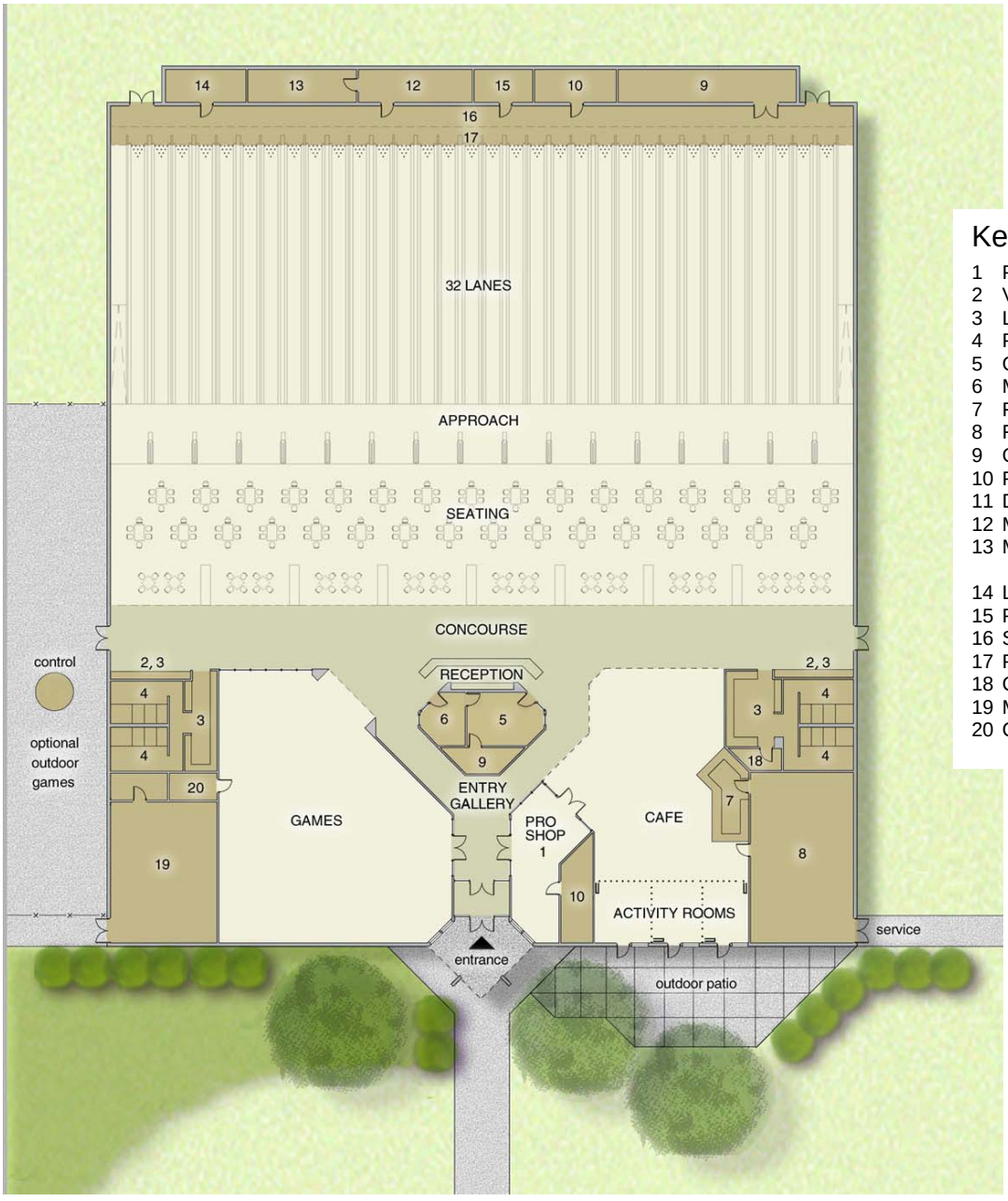
			AREA IN SF	AREA IN m^2
Nominal Total Constructed Area (Gross Area):			***30,000***	***2,800***
Programmed Areas (Net Area):				
Bowling	Lanes		11,200	1,040
	Bowler and Spectator Seating		4,700	437
	Concourse		1,700	158
Mechanics	Mechanic's Workroom, Toilet		300	28
	Mechanic's Storage		150	14
	Lane Maintenance Storage		120	11
	Pinsetting		640	59
	Pin Storage		150	14
	Service Aisle		710	66
Dining	Café (Snack Bar)		1,000	93
	Activity Rooms		425	39
Food/ Beverage	Service Counter		125	12
	Bar Service Counter		100	9
	Cooking Area		300	28
	Food Preparation		350	33
	Storage		150	14
	Refrigerator/freezer		150	14
	Receiving		100	9
Games	Amusement Machines		2,000	186
Pro Shop	Display Sales Room		300	28
	Drill Room		80	7
	Pro Shop Storage		100	9
Administration	Reception		225	21
	Reception Storage Alcove		100	9
	Manager's Office		120	11
	General Office		180	17
Support	Patron Toilets		500	46
	Lockers/Vending		300	28
	General Storage		300	28
	Custodial		75	7
	Subtotal of Programmed Area (Net)		***26,650***	***2,476***
Walls, Circulation, Overhangs	*% of Programmed Area:*	*8%*	2,132	198
	Subtotal of Building Area (Gross)		***28,782***	***2,674***
Mechanical, Electrical, Communications	*% of Building Area:*	*5%**	1,439	134
Total Constructed Area (Gross Area)			***30,221***	***2,808***
			(Area in SF)	***(Area in m^2)***

*This is based on industry standards. Local conditions may require other sizes.

5-3 32 Lane Center

The 32 lane Bowling Center represents an example of the largest range of facility sizes likely for new construction. Again, the centralized organization provides a basis for adjustments to accommodate other sizes and for renovation projects.

Figure 5-3: Example Plan for 32 Lane Center



Key to Spaces:

1 Pro shop sales display
2 Vending
3 Lockers
4 Patron toilets
5 General office
6 Manager's office
7 Food service-cooking
8 Food preparation/ storage
9 General storage
10 Pro shop storage
11 Drill room
12 Mechanic's workroom
13 Mechanic's storage/ laundry/toilet
14 Lane maintenance storage
15 Pin storage
16 Service aisle
17 Pinsetters
18 Custodial
19 MEP, FP and Electric room
20 Communications room

Table 5-3: Space Allocation for 32 Lane Center

			AREA IN SF	AREA IN m^2
Nominal Total Constructed Area (Gross Area):			***42,000***	***3,900***
Programmed Areas (Net Area):				
Bowling	Lanes		14,700	1,366
	Bowler and Spectator Seating		6,400	595
	Concourse		2,700	251
Mechanics	Mechanic's Workroom, Toilet		360	33
	Mechanic's Storage		200	19
	Lane Maintenance Storage		160	15
	Pinsetting		840	78
	Pin Storage		200	19
	Service Aisle		930	86
Dining	Café (Snack Bar)		2,000	186
	Activity Rooms		650	60
Food/ Beverage	Service Counter		150	14
	Bar Service Counter		100	9
	Cooking Area		350	33
	Food Preparation		350	33
	Storage		200	19
	Refrigerator/freezer		200	19
	Receiving		150	14
Games	Amusement Machines		3,000	279
Pro Shop	Display Sales Room		300	28
	Drill Room		80	7
	Pro Shop Storage		150	14
Administration	Reception		250	23
	Reception Storage Alcove		125	12
	Manager's Office		120	11
	General Office		300	28
Support	Patron Toilets		600	56
	Lockers/Vending		400	37
	General Storage		500	46
	Custodial		100	9
	Subtotal of Programmed Area (Net)		***36,565***	***3,397***
Walls, Circulation, Overhangs	*% of Programmed Area:*	*8%*	2,925	272
	Subtotal of Building Area (Gross)		***39,490***	***3,669***
Mechanical, Electrical, Communications	*% of Building Area:*	*5%**	1,974	183
Total Constructed Area			***41,464 (Area in SF)***	***3,852 (Area in m^2)***

* This is based on industry standards. Local conditions may require other sizes.

Chapter 6 Specialized Requirements

6-1 Finishes/Fixtures, Furnishings and Equipment

This section provides an illustrative list of furnishing and equipment items, and a description of recommended materials and finishes for the Bowling Center. This guidance must be confirmed with the specific requirements of the Installation and with local building practices. It is highly recommended that Comprehensive Interior Design (CID), which includes Structural Interior Design (SID), be made an integral part of the design process.

Seymour Johnson AFB – North Carolina

See next page for Table 6-1: Room Finish Schedule

Table 6-1: Room Finish Schedule

ROOM DESCRIPTION	FLOORING				WALLS				CEILING		
	Carpet	Resilient	Ceramic, Quarry Tile	Concrete, Other	Brick, Wood	High Impact Gypsum Board	Ceramic Tile	Exposed CMU	Open to Structure	Acoustical Tile	Gypsum Board
Public											
Main Entrance			O		O	O			O	O	O
Entry Gallery	O		O		O	O			O	O	O
Concourse	O		O		O	O			O	O	O
Patron Toilets			O				O				O
Lockers	O	O				O				O	
Bowling											
Lanes and Approaches				O		O				O	
Bowler Seating and Spectator Seating		O				O				O	
Mechanics											
Pinsetters/ Service Aisle				O		O		O	O	O	
Mechanic's Workroom		O				O				O	
Mechanic's Toilet			O				O				O
Laundry		O	O			O				O	
Storage		O		O		O		O	O	O	
Administration											
Reception Counter	O				O	O				O	O
Reception Storage Alcove	O					O				O	
General Office	O					O				O	
Manager's Office	O					O				O	
Pro Shop											
Sales Display	O					O				O	O
Sales Storage		O				O				O	
Drill Room		O				O				O	
Dining											
Café (Snack Bar)	O		O		O	O				O	O
Activity Rooms	O		O		O	O				O	O
Lounge/ Bar	O		O		O	O				O	O
Restaurant	O		O		O	O				O	O
Food/Beverage Service											
Food Service Counter			O		O	O				O	O
Bar Service			O		O	O				O	O
Cooking-Serving Area			O			O	O				O
Food Preparation Area			O			O	O				O
Food Storage		O				O				O	
Receiving		O				O				O	
Games											
Amusement Machines	O	O			O	O			O	O	O
Lounge Games	O	O			O	O				O	O
Slot Machines	O					O				O	
Building Services and Storage											
Custodial		O				O		O		O	
General Storage		O				O		O		O	
Mechanical				O		O		O	O		
Electrical				O		O		O	O		
Communications		O				O				O	

Table 6-2: Fixtures, Furnishings and Equipment List

Concourse	Scoring (overhead monitors, touch screen or keypad computers at seating) Seating and tables Coat racks Trash receptacle Vending – self-serve bowler's accessories ATM machine Ball washer Display board/case Lockers (R – if built-in)* Ball racks Sound System (R: only speakers and wiring) Point of sale terminals
Toilet rooms	Baby changing station (R) Hand dryer (R) Paper towel dispenser (R) Seat cover dispensers (R) Trash receptacle (R – if built-in)
Bowling	Ball returns (R) Pin spotters (R) Masking units (R) Bumpers, air compressors "Glow package" – including lane tracer lights
Mechanic's Area	Work bench Lockers (R – if built-in) Storage compartments and shelving Pin cleaner Computer Desk and chair Lane cleaning machine Metal cabinet for supplies Washer/dryer
Administration	Desk and desk chairs Guest seating Computers File Cabinets Time management system Work counter (R – if built-in) Safe
Pro Shop	Display counters (R – if built-in) and tables Wall display units (slot wall) (R – if built-in) Mirrors (R) Point of sale system Ball drilling machine Ball spinner Utility sink (R) Storage Shelving (R – if built-in)
Dining and Activity Rooms	Tables, chairs TV monitors Sound system (R: only speakers and wiring) Trash receptacles
Food/Beverage Service	See Table 6-4
Games	Token Machine Amusement machines Table games (option) Lockers (coin-operated) (R – if built-in) Slot machines (OCONUS option)
Custodian	Shelving System (R – if built-in) Mop storage rack (R)
Exterior Spaces	Benches Tables and chairs (option) Trash receptacles Dumpster

*Please see explanation of (R) on next page.

(R) = Real Property Installed Equipment (RPIE). RPIE is purchased and installed with construction project funds. All other listed equipment is purchased with equipment funds and installed with either construction project or equipment funds. Infrastructure to support all types of equipment should be included in the construction contract.

6-2 Food Service

6-2.1 Programming Menu

The following menu indicates the range of food that the kitchen should be able to produce. Each facility may develop other menu items or establish themes based on local specialties. The kitchen illustrated in the following section has been designed to serve at least the items listed.

Table 6-3: Food Service Programming Menu

Breakfast	Lunch/Dinner
A La Carte	***Appetizers/Snacks***
Eggs/Egg Sandwiches	Nachos/Chips
Cereal – Hot/Cold	Pretzels
Pancakes	Peanuts
Waffles	French Fries/Onion Rings/Jalapeno
Bacon	Cheese Sticks
Sausage	Poppers
Hashbrowns	Soup
Toast	
Fruit	***Entrees***
	Burgers
	Chicken Sandwiches
	Buffalo Chicken Wings
	Hot Dogs
	Hot Sandwiches – Melts, Cheese steaks
	Cold Sandwiches – Tuna, Turkey
	Salad
	Pizza
	Seafood
	Local Specialty Entrée
	Beverages
	Coffee
	Iced Tea
	Soda
	Juice
	Milk
	Bottled Beverages
	Water
	Beer, wine and pre-packaged liquor

6-2.2 Example Equipment Plan

Based on Layout for 24 Lane Center

Figure 6-1: Example Food Service Equipment Plan

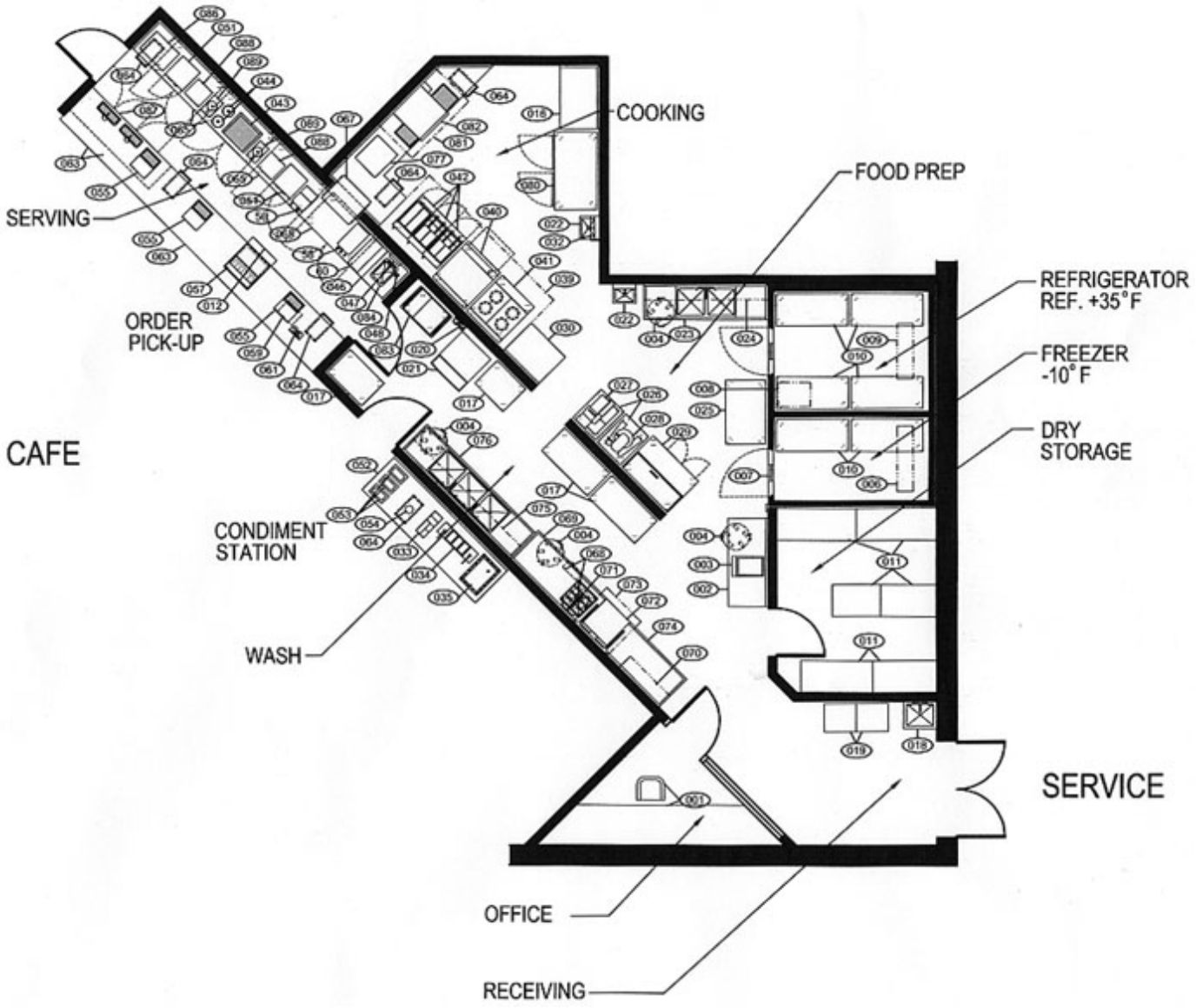


Table 6-4: Example Food Service Equipment List

Item No.	Qty	Description	Item No.	Qty	Description
001	1	Desk and Chair	047	1	Paper Towel Dispenser
002	1	Receiving Worktable	048	1	Soap Dispenser
003	1	Scale	051	2	Display Case, Heated
004	4	Trash Container, Lid, Dolly	052	1	Condiment Counter
005	1	Condensing Unit -10F (R)*	053	3	Napkin Dispenser
006	1	Evaporator Coil -10F (R)	054	1	Trash Chute (R)
007	1	Walk-in Complex (R)	055	3	P.O.S. System
008	1	Condensing Unit +35F (R)	056	1	Coffee Brewer
009	1	Evaporator Coil +35F (R)	057	1	Soda/Ice Dispenser
010	9	Shelving Unit, Mobile	058	1	Iced Tea Brewer
011	7	Dry Storage Shelving (R – if built-in)	059	1	Carbonator
012	1	Cup Holder	060	1	Juice Dispenser
016	1	Worktable	061	1	Water Filter
017	4	Shelving Unit, Mobile	063	1	Serving Counter Bar (R – if built-in)
018	1	Mop Sink, Hanger (R)	064	5	Trash Container
019	2	Bag in Box Rack	065	4	Undercounter Refrigerator
020	1	Water Filter	066	1	Work Counter (R – if built-in)
021	1	Ice Cuber and Bin	067	1	Heated Display Case
022	2	Hand Sink (R)	068	1	Waste Disposer (R)
023	1	Two Compartment Sink (R)	069	1	Soiled Dishtable (R)
024	1	Wall Shelf (R – if built-in)	070	1	Pot Rack / Wall Shelf (R)
025	1	Mobile Worktable	071	1	Faucet, Pre-Rinse (R)
026	2	Mixer Table, Mobile	072	1	Warewasher (R)
027	1	Slicer	073	1	Condensate Hood (R)
028	1	Mixer, 20-Quart	074	1	Clean Dishtable (R)
029	1	Pizza Prep Table	075	1	Pot Rack / Wall Shelf (R)
030	1	Sandwich Prep Table	076	1	Three Compartment Pot Sink (R)
032	1	Fire Extinguishing System (R)	077	1	Cutting Board
033	1	Condiment Organizer	080	1	Refrigerator/Freezer
034	1	Condiment Dispenser	081	1	Exhaust Ventilator (R)
035	1	Iced Cold Pan	082	1	Conveyor Pizza Oven
039	1	Exhaust Ventilator (R)	083	1	Ice Caddy
040	1	Range, w/Griddle Top	084	1	Drop-In Hand Sink (R)
041	1	Range, Open Burner Top	085	1	Back Counter (R – if built-in)
042	1	Fryer Battery w/Dump & Filter	086	1	Display Rack
043	1	Hot Dog Roller Grill & Warmer	087	1	Beer Dispenser
044	2	Soup Warmer, Kettle	088	2	Nacho Warmer
046	1	Stainless Steel Splash Guard (R)	089	2	Nacho Cheese Dispenser

*(R) = Real Property Installed Equipment (RPIE). RPIE is purchased and installed with construction project funds. All other listed equipment is purchased with equipment funds and installed with either construction project or equipment funds. Infrastructure to support all types of equipment should be included in the construction contract.

6-2.3 Technical Details for Food Service Areas

6-2.3.1 Architectural Details

Doors and Openings

- Door openings of a minimum 3'-0" by 7'-0" (914 by 2133 mm) with flush sills are required from building delivery through to kitchen and all accesses required for foodservices.
- Exterior delivery access doors must be protected with fly fans or insect screen protection.
- All doors in traffic aisles should have vision panels.
- Office doors in the kitchen should have large windows.
- Door to dining areas must be sight line protected and acoustically treated.
- Doors require 4'-0" (1219mm) kickplates.

Floors

- Finished floor in kitchen should be 15 percent abrasive, non-slip quarry tile (100 homogeneous) with black epoxy grout to avoid discoloration of grout from food acids. Alternate finishes that may be considered are:
  - A poured and troweled cupric oxychloride flooring such as Hubbellite;
  - For a resilient floor use a sheet vinyl material with "welded" impervious joints;
  - Non-slip tile is recommended for servery floors and similar high traffic areas.
- Kitchen floor finish should extend into walk-in and roll-in refrigerators and freezers.

Walls

- Coved bases are required to be a minimum of 6 inch (150 mm) high.
- Walls should be a smooth, easily cleaned, non-absorbent hard surface. Material choices include:
  - Ceramic tile with acid proof grout is preferred.
  - Glazed concrete masonry units.
  - Water resistant gypsum wallboard on structural 16-gauge studs clad with fiberglass reinforced panels and battens.
  - Painted dry wall partitions in kitchen are not recommended.
  - Wet areas require a water proof wall finish such as ceramic tile, fiberglass reinforced plastic, or smooth, epoxy painted, skim coated cement masonry block.

- 42 inch (1066 mm) high corner guards at exposed column and wall edges are recommended.
- Bumper guards are required for heavy cart traffic areas.
- All control panels are to be recessed.
- Walls between dining rooms and kitchen/warewashing areas must have sound attenuation.
- When stud walls are used, all walls intended to support wall shelving, wall cabinets, utensil racks, exhaust ventilators, hand sinks, etc. must be provided with blocking. Construction must support 50 pounds (25kg) per linear foot.

Ceilings

- Finished ceilings should be a minimum of 9'-0" (2745 mm) above the finished floor.
- Finished ceiling should be a smooth, acoustically rated, non-absorbent, washable surface which will require approval by local health authorities.
- Walk-in refrigerators, freezers and exhaust ventilators should be closed to the ceiling with enclosure panels.
- Verify requirement for fire-rated enclosures around exhaust ventilators that penetrate finished ceilings, such as at the hoods.

Lighting

- Warm white deluxe fluorescent lights should be used in the kitchen complete with non-breakable diffusers.
- All lighting fixtures used in foodservice areas must be equipped with lens protectors.
- Ceiling fixtures should be recessed.

Windows

- Minimum sill height suggested to be 48 inches (1220 mm) to allow for equipment against wall under window.

Waste

- A central grease trap outside the building in a vehicle accessible location is recommended.

Miscellaneous Architectural Details

- Space for the installation of remote refrigeration condensing units is needed. An exterior location is recommended.
- Space must be available for kitchen exhaust air pollution control unit when required.
- Provide large windows in kitchen office for control purposes.

6-2.3.2 Engineering Details

Water and Drains

- Water temperature at hand basins shall not exceed 110°F (43°C). Potwashing sinks, dishwashing machines and water wash exhaust ventilators require a minimum of 140°F (60°C).
- If water hardness is over 6 GPG provide water softener and soft water lines to all equipment requiring a water connection. Below 2 GPG, some equipment functions can be adversely affected.
- Water wash systems in exhaust ventilators are recommended.
- Food waste disposers (garbage grinders) are recommended.

Ventilation

- 20 to 30 air changes per hour in the kitchen are required.
- The air supply into the kitchen should be tempered.
- Spot cooling is required in cold food preparation and plating areas.
- Negative air pressure must be maintained in the kitchen to control odor transfer.
- Separate fans and duct systems are required for:
  - Cooking exhaust;
  - Wood fired equipment;
  - Dishwashing exhaust.
- Exhaust hood control panels require 24 hour uninterrupted power.
- Air cooled refrigeration equipment requires adequate ventilation of not less than 1,000 cfm (472 L/S) per horsepower [250 cfm (118 L/S) for watercooled].

Fire Control

- Protection of cooking equipment and hood and duct systems must be through a listed sprinkler system attached to the building sprinkler systems when the building is sprinklered.
- Protection of the cooking equipment and hood and duct system must be accomplished with a wet chemical extinguishing system where the building is not sprinkler protected.

Electrical

- Back-up power is required for:
  - Exhaust hood control panel;
  - Walk-in freezer;
  - Walk-in refrigerators;
  - Other equipment required for emergency service.

- Connect walk-ins to a central enunciator panel for temperature monitoring where available.
- Connect exhaust ventilators and/or fire protection systems to central enunciator panels. Dry switch contacts are to be provided with the systems.

Structural

- All foodservice storage and preparation area floor slabs should be designed for 150 psf (10.55 Kg/cm2).
- Expansion joints cannot be located within prefabricated walk-in refrigerators and freezers, floor depressions or equipment raised bases.

6-3 Building Systems

The Bowling Center should be designed to meet prevailing economic and engineering constraints. The design should meet life cycle cost and value engineering criteria. Life cycle cost analyses should be equivalent to the methodologies outlined in the National Bureau of Standards Handbook (NBS 135), Life Cycle Cost Manual of the Federal Energy Management Program.

Other general design issues include the following:

6-3.1 General

- All building systems specifications must be verified with the Installation Civil Engineering Office.
- Note that the game of bowling puts unique demands on the design of the HVAC system. For example, temperature and humidity can cause the bowlers' shoes to stick on the approaches and become a safety issue. Small temperature variations can also affect the condition of the lanes.
- Preliminary floor space requirements for MEP/FP equipment should range from 3 percent gross building area for large Centers to 5 percent for small Centers. Actual floor space requirements are dependent on geographic location, building size, architectural design, mechanical design and other factors. Proper ceiling space for ductwork and equipment must be considered.
- Space for outdoor equipment (e.g. condensing units, oil tanks, and transformers) must be accommodated and coordinated with the exterior space use and landscape design, and with force protection standards. Care must be taken to locate this and any other exterior building mounted equipment away from the building entrance and to provide visual and acoustical shielding.
- Refer to bowling equipment supplier/manufacturer for published design and installation requirements for interior environmental conditions, load information, acoustic criteria and lighting guidelines. Note that year-round relative humidity (RH) control is required for bowling centers. RH must be maintained within the range of 40 to 50 percent. Areas for humidity and temperature control include the pinsetting equipment and over the lanes.

6-3.2 Structural Systems

Select a structural system that will achieve several design goals:

- Provide a clear span structure, open from the pins to the back of the concourse.
- Arrange the spanning structural elements parallel to the lanes for future expansion flexibility.
- Allow for high bay spaces for bowling, the concourse and other major activity areas.
- Permit flexibility for reconfiguring the floor plan in the administration, food preparation, and service areas.

Select the structural system based on achieving an economical system that meets engineering standards, including consideration of:

- Projected load requirements
- Bearing conditions including subsoil and drainage considerations
- Prevailing and available construction practices
- Regulatory constraints including force protection standards, seismic loading, safety issues, and climactic conditions.

6-3.3 Mechanical Systems

The Bowling Center is likely to be a single story building with large volume spaces. The various activity areas will have differential operating requirements. Design considerations to achieve an economical system in designing the HVAC systems for the Bowling Center include the following items:

- Load calculations shall be performed in accordance with ASHRAE standards, based on local weather conditions, and the applicable energy code. Be aware of latent heat as an HVAC design issue.
- Mechanical systems shall be designed according to local code requirements. If local codes are not in force, the International Mechanical Code (IMC)–2000 shall be used.
- Mechanical systems shall be designed according to the International Energy Conservation Code – 2000, ASHRAE 90.1 – 1999 or other applicable local energy code.
- Ventilation shall be provided in accordance with ASHRAE Standard 62-2001.
- A single hot water boiler, sized as defined above, shall provide heating. If central steam is not available, the recommended fuel is natural gas. If gas is not available, fuel oil or other locally available fuel may be used, stored in an above ground tank. The tank shall be proved with containment and spill alarm systems.
- Provide vent/flue for boiler and water heater.
- Provide heating coils in air handling units for pre-heat, warm-up and unoccupied hours heating.

- Provide heating coils in overhead ductwork, arranged, sized and controlled by function.
- Provide factory controls and programmable thermostats.
- Provide direct exterior access to the mechanical room.
- Provide mechanical room ventilation and unit heater.
- Provide combustion air for boiler and water heater.
- The hot water distribution system shall be provided with duplex pumps.
- Provide air-conditioning for all areas in the building, except as noted below. Suggested engineering approaches include air-cooled split system DX with indoor air handling units; chilled water; and desicant dryers. Review with Installation Civil Engineering Office. Unit(s) shall include air-side economizer where required by the applicable energy code.
- Provide electronic humidifiers and humidity controls for year-round relative humidity control.
- Provide 30 percent pre-filters and electrostatic, high efficiency particulate or activated charcoal as final filters. Selection should be based on cost and local environment.
- System shall be designed to meet acoustic criteria recommended by the equipment supplier.
- Provide a kitchen hood exhaust fan, sized to meet the specified hood performance. (Coordinate with Food Service Design Consultant.) Provide hood exhaust duct as required by NFPA 96. Provide make-up air unit and heat recovery capability as required by the International Energy Conservation Code – 2000 or other applicable local energy code. The kitchen shall not be air-conditioned. Provide dishwasher exhaust (if dishwashing machine is furnished). Dishwasher exhaust shall be aluminum or stainless steel, watertight.
- Provide exhaust system for the toilets and janitor's closet.

6-3.4 Plumbing Systems

Plumbing systems for the Bowling Center will need to support all of the functions of the facility and most notably the kitchen. Considerations to be taken into account include the following items:

- Plumbing systems shall be designed according to local code requirements. If local codes are not in force, the International Plumbing Code (IPC) – 2000 shall be used.
- Domestic hot water systems shall be designed in accordance with ASHRAE Standards and 90.1 – 1999.
- Domestic hot water system temperatures shall comply with local Health Codes. If local codes are not in force, provide a booster heater to provide 180 degrees F. to the dishwasher (if provided).
- Provide separate hand washing stations in the kitchen.

- Fuel for domestic hot water heating shall be natural gas, if available. If natural gas is not available, provide electrical storage heater.
- Provide floor drains and hose bibbs in toilet rooms.
- Provide wall hydrants on building exterior.

6-3.5 Fire Protection Systems

The Bowling Center is a place of public assembly. Achieving appropriate fire protection will include meeting the following provisions:

- Fire Protection features shall comply with UFC 3-600-01 *Fire Protection Engineering*.
- Provide wet chemical or water-based fire suppression system in the kitchen hood.
- Fire alarm system and wiring shall comply with NFPA 72.
- Provide battery powered emergency lighting and illuminated exit signs.
- Provide ADA compliant fire alarm system consisting of a fire alarm control panel (FACP), audio/visual signaling devices, and manual pull stations.

6-3.6 Electrical Systems

The electrical system of the Bowling Center shall be designed to support the multiple activities of the Center and must include the following considerations:

- Electrical systems shall be designed in accordance with the National Electrical Code (NEC), and applicable local codes and regulations, including the applicable energy code.
- Recommended lighting levels are listed in Chapter 4 for the specific functional areas. Where not otherwise specified, provide lay-in fluorescent fixtures in offices and back-of-house spaces; downlights and decorative, dimmable fixtures in the dining rooms; fluorescent strip fixtures in mechanical and utility spaces; lensed fixtures in food preparation and storage areas.
- Electrical service shall be sized based upon the calculated loads and size of the building, with spare capacity for future loads (20 percent).
- Electrical service shall be connected to the local utility or to the base distribution system, as appropriate. The service shall be grounded as required by code.
- A pad-mounted transformer shall be provided, which will serve as the demarcation point between the exterior service and the building power.
- Secondary service from the transformer shall connect to a main service overcurrent protection and disconnecting device.
- Metering shall be provided. Either check metering on the Bowling Center, if primary metering is in use, or secondary metering on the load side of the transformer, in accordance with local utility or base requirements.

- Secondary service voltage shall be 208/120V, 3Ø, 4 wire. Therefore, interior transformers are not required. Voltage requirements may vary for overseas locations, and should be verified before beginning design.
- Provide direct exterior access to the electric room.
- The MDP (main distribution panel) shall serve the large three phase mechanical equipment and feed branch circuit panelboards. Provide separate panelboards for the kitchen, general lighting and power, and single phase and smaller three phase mechanical equipment.
- Run all circuits in steel conduits with insulated copper conductors. Conduits can be RMC (rigid metal conduit), IMC (intermediate metal conduit), or EMT (electrical metallic tubing), as required for the level of physical protection required. Where approved by the local authorities having jurisdiction, and where installed as per Code, flexible metallic cable assemblies with metal jacket and full size insulated grounding conductor (type MC or type AC) are suitable for installation in studded partitions and above suspended ceilings.
- All power wiring shall run concealed.
- Provide manual toggle switches, dimmers and automatic lighting controls (occupancy sensors, time clocks) for lighting as appropriate for the bowling area, dining, kitchen, pro shop, back of house and offices. Locate controls in the reception counter. Lighting controls shall meet the requirements of the local energy code.
- Provide convenience receptacles, special configuration receptacles and power for user's equipment and mechanical equipment.

6-3.7 Exterior Lighting Systems

Exterior lighting systems shall be designed to include the following provisions:

- Provide pole mounted metal halide lighting for parking areas and low level metal halide bollards for walkways.
- Provide metal halide or compact fluorescent fixtures in exterior canopies and at exterior door locations.
- Provide pole-mounted metal halide for outdoor activities.
- Provide time clock/photocell control for all exterior lighting.

6-3.8 Communication Systems

Considerations for providing appropriate communications systems support for the Bowling Center include:

- Provide provisions (boxes, raceways, power) for security, telephone, data, point-of-sale (POS), network, public address (PA), cable access television (CATV), arcade games, Internet, closed circuit television (CCTV) where applicable and other low voltage systems.

- Communications wiring shall be brought into the building underground to a dedicated communications room, in PVC or rigid metal conduit to the head end equipment. Communications wiring shall be run in raceways in areas subject to damage, such as in walls or in unfinished areas. Other areas (e.g. above ceilings) may not require conduits.
- Review security/privacy/interference issues with the user/operator to determine if multiple communications (low voltage) systems can be installed in the same conduit.

Sustainable facilities achieve optimum resource efficiency and constructability while minimizing adverse impacts to the built and natural environments through all phases of its life cycle. The goals of sustainable development are to conserve energy, water, and raw materials; prevent environmental degradation caused by construction, operations, and disposal of facilities; and create built environments which are livable, healthy, maintainable, and productive. These goals are compatible with providing a desirable and economically viable recreation facility.

6-4 Sustainable Development

Sustainable facilities achieve optimum resource efficiency and constructability while minimizing adverse impacts to the built and natural environments through all phases of its life cycle. The goals of sustainable development are to conserve energy, water, and raw materials; prevent environmental degradation caused by construction, operations, and disposal of facilities; and create built environments which are livable, healthy, maintainable, and productive. These goals are compatible with providing a desirable and economically viable recreation facility.

6-4.1 Sustainable Goal

The Bowling Center should incorporate the principals of sustainable design in the development of the design. Guidance is provided by the US Green Building Council (http://www.usgbc.org) in its Leadership in Energy and Environmental Design (LEED) Green Building rating system. The design should achieve the highest LEED rating (documented in the Design Analysis) that the budgeted amount will allow, with the goal of being LEED certifiable.

6-4.2 Incorporate Sustainable Development principles by:

- Site: demonstrate that site planning has evaluated solar and wind orientation and existing site conditions to develop optimal building siting and appropriate low maintenance landscaping.
- Energy: demonstrate that building orientation and massing, natural ventilation, day-lighting, and other passive strategies have been evaluated in an effort to increase the quality of the indoor environment and comfort of the occupants. Demonstrate that the system selection is the most efficient through the use of an advanced computer modeling and life cycle cost analysis.

- Building materials: evaluate the use of environmentally preferable materials that limit impacts on the environment and occupant health within the parameters of performance, cost, aesthetics and availability.
- Indoor air quality: evaluate design strategies that limit sources of contamination before they enter the building.
- Water: evaluate the use of water conservation through the use of low flow fixtures, appropriate landscaping and natural filtration of rainwater.
- Recycling and conservation: accommodate recycling into the building design and limit waste during construction by recycling construction waste.

Appendix A Resources and Links

This appendix provides a list of references, including other Air Force, Department of Defense and national standards documents that give related guidance, to be used in conjunction with this design guide.

AFPD 32-10 Installations and Facilities
(http://afpubs.hq.af.mil/pubfiles/af/32/afpd32-10/afpd32-10.pdf)

AFI 32-1022 Planning and Programming of Nonappropriated Fund Facility Construction Projects
(http://www.e-publishing.af.mil/)

AFI 32-1023 Design and Construction Standards and Execution of Facility Construction Projects
(http://www.e-publishing.af.mil/)

AFI 32-1024 Standard Facility Requirements
(http://www.e-publishing.af.mil/)

MIL-HDBK-1190, Facility Planning and Design Guide (contact HQ AFCESA,
(http://www.afcesa.af.mil/Directorate/CES/default.html)

AFI 32-1032 Planning and Programming Real Property Maintenance Projects Using Appropriated Funds
(http://www.e-publishing.af.mil/)

AFH 32-1084 Standard Facility Requirements
(http://afpubs.hq.af.mil/pubfiles/af/32/afh32-1084/afh32-1084.pdf)

AFI 65-106 Appropriated Fund Support of Morale, Welfare and Recreation and Nonappropriated Fund Instrumentalities
(http://www.e-publishing.af.mil/)

AFI 34-105 Programming for Nonappropriated Fund Facility Requirements
(http://www.e-publishing.af.mil/)

USAF Project Managers' Guide for Design and Construction
(http://www.afcee.brooks.af.mil/dc/products/pmguide/pmguide.asp)

AFI 32-7062 USAF Comprehensive Planning
(http://www.e-publishing.af.mil/)

AFPAM 32-1010 Land Use Planning
(http://afpubs.hq.af.mil/pubfiles/af/32/afpam32-1010/afpam32-1010.pdf)

USAF Landscape Design Guide
(http://www.afcee.brooks.af.mil/dc/dcd/land/ldg/index.html)

USAF Master Landscape Construction Specifications
(http://www.afcee.brooks.af.mil/dc/dcd/land/mstrland/mlcs.htm)

HQ AFCEE Accessibility Page
(http://www.afcee.brooks.af.mil/dc/products/dcproducts.asp)

Uniform Federal Accessibility Standards (UFAS)
(http://www.access-board.gov)

Americans with Disabilities Act Accessibility Guidelines (ADAAG)
(http://www.access-board.gov/adaag/html/adaag.htm)

AF Sustainable Facilities Design Guide
http://www.afcee.brooks.af.mil/dc/products/dcproducts.asp.

Leadership in Energy and Environmental Design (LEED) Green Building Rating System
(http://www.usgbc.org)

EPA website
(http://www.epa.gov/cpg/products)

Energy Star website
(http://www.energystar.gov/products)

AFI 31-210, USAF Antiterrorism/Force Protection (AT/FP) Program Standards
(http://www.e-publishing.af.mil/)

USAF Force Protection Design Guide
http://www.afcee.brooks.af.mil/dc/dcd/arch/force.pdf

UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings
(http://www.afcee.brooks.af.mil/dc/products/dcproducts.asp)

The Air Force Architectural Compatibility Design Guide
(http://afcee.brooks.af.mil/dc/dcd/arch/ACguide/liveACG/index.htm)

AFPAM 32-1097 Sign Standards Pamphlet
(http://afpubs.hq.af.mi/pubfiles/af/32/afpam32-1097/afpam32-1097.pdf)

USAF Interior Design Guides
(http://afcee.brooks.af.mil/dc/dcd/interior/intdespu.htm)

USAF Cost Guides/Handbooks
(http://www.afcesa.af.mil/Directorate/CES/default.html)

AJMAN 32-1058, Masonry Structural Design for Buildings
(http://afpubs.hq.af.mil/pubfiles/af/32/afji32-1058/afji32-1058.pdf)

International Building Code (IBC)

National Fire Protection Association (NFPA)
(http://www.nfpa.org)

Engineering design and Construction
(contact HQ AFCESA http://www.afcesa.af.mil/Directorate/CES/default.html)

National Electrical Code (NEC)
http://www.mikeholt.com/nec/nec.htm)

Illuminating Engineering Society's Illuminance Selection Procedure (IES)
(http://www.iesna.org)

UFC 3-600-01, Design: Fire Protection Engineering